VOLUME 1 NUMBER 6 JUNE 1994

OS/2 MAGAZINE

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X Windows On WPS

Networking In A Nutshell

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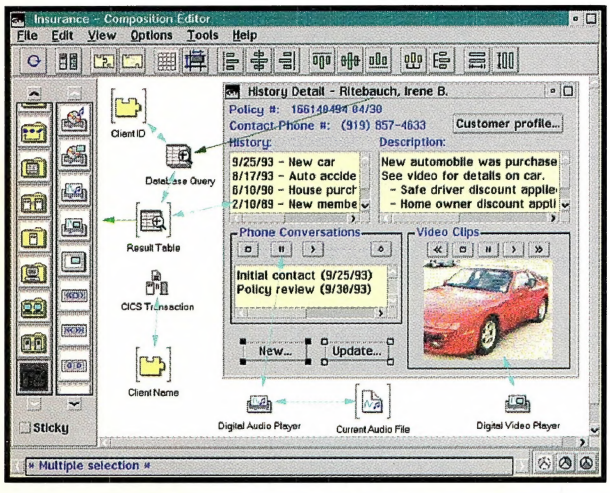

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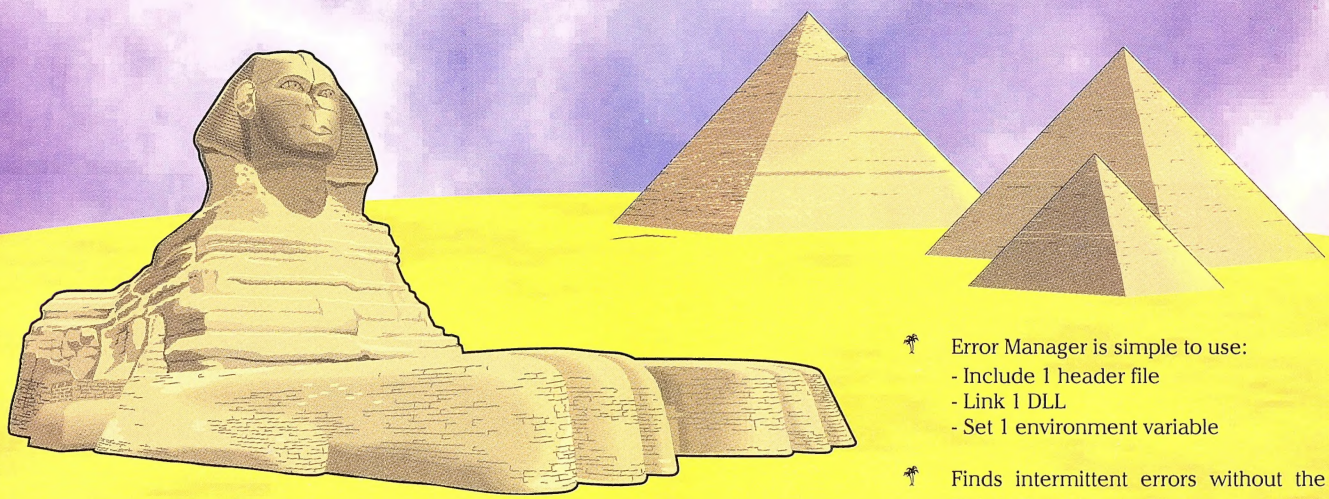

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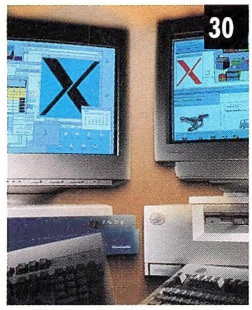

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SEND ADDRESS CHANGES TO: *OS/2 MAGAZINE*, CIRCULATION DEPARTMENT, PO BOX 56664, BOULDER,CO 80323-6664. TELEPHONE (800) 765-1291.

EDITORIAL POLICY: *OS/2 MAGAZINE* IS AN INDEPENDENT PUBLICATION WITHOUT OBLIGATION TO ANY HARDWARE OR SOFTWARE VENDOR, DEALER, OR DISTRIBUTOR. SEND EDITORIAL QUERIES TO *OS/2 MAGAZINE*, EDITORIAL DEPARTMENT, 600 HARRISON ST., SAN FRANCISCO, CA 94107.

ABC MEMBERSHIP APPLIED FOR OCTOBER 1993

ISSN #1073-1547

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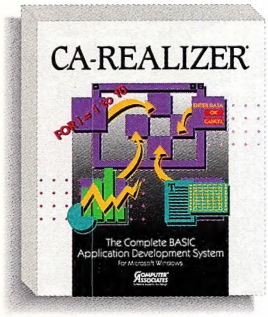

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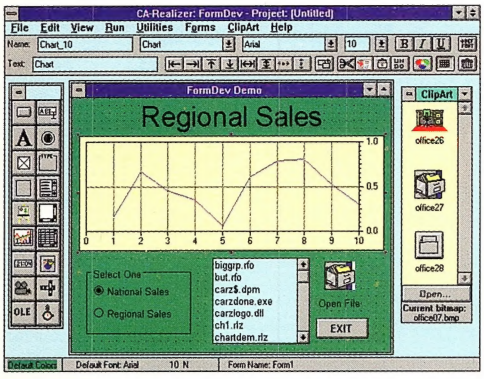

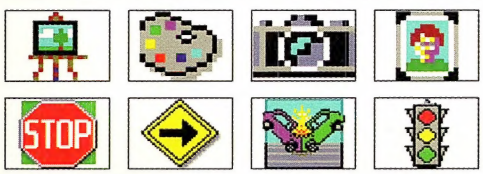

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Perspectives

Networks, Programming, and On-line Services

One of the annual traditions in the world of computing publishing is the exhaustive Subscriber Study. We've just completed the tabulation of *OS/2 Magazine*'s first such study, and I'm pleased to report that most of our assumptions about what you want to read about, as a business user of OS/2, were accurate. Still, based on information in the subscriber study, we're making a few minor adjustments, such as Mark Minasi's new column, "Under the Hood," and you'll see some other slight changes over the next few months.

Here are a few of the more interesting results, along with my interpretation. Please note: This study polled a random sampling *OS/2 Magazine*'s subscribers only, and only approximates the universe of serious OS/2 users.

- **You have heavy-duty PCs:** 82% of you use 33MHz 486 PCs or faster; 57% have 12 to 16MB RAM; more than 20% of you have 17MB RAM or more. This result confirms what we suspected: You're a serious computer user, running serious applications. Fewer than five percent of you use or manage OS/2 computers with 4MB RAM or less.
- **Most of you (more than 85%) are running Windows applications under OS/2.** That shows that *OS/2 Magazine* readers are practical users, not zealots. Your computer is on your desk to run applications. Where an outstanding OS/2 application is available, you'll use it, but when a Windows application offers better features for your business, or is the only game in town, that's what you'll use.
- **About 53% of you have HPFS disk partitions. More than 77% have FAT.** The fact that most of you have either formatted new hard disks, or reformatted existing drives, shows that you've decided that you're using OS/2 for the long haul.
- **Most of you are networked.** The most popular LAN is NetWare at 32% of subscribers. The other major networks you use are LAN Server (24%), a UNIX server (6%), LAN Manager (3.4%), and Vines (1.5%).
- **More than 75% of you write programs.** About 47% use C or C++, and 34% use REXX. Although most of you program, we've decided to stick with our original decision of *not* covering software development topics in *OS/2 Magazine*, since our sister publication, *OS/2 Developer*, more than adequately addresses those concerns. Instead, we'll concentrate on the other issues that all OS/2 users face—developers included. The only regular programming coverage we'll offer is Alex Lane's column, which will continue to explore the use of REXX for increased personal productivity.
- **Most of you (63%) are members of your firm's MIS/DP, IS, PC support, or equivalent departments.** About 95% of you offer computing assistance to coworkers or customers. Our survey indicates a strong need for issues regarding networking, database, systems administration, and other enterprise topics. We'll keep covering those topics, along with publishing personal-productivity articles.
- **About 73% of you are on-line.** About 44% our subscribers have CompuServe accounts, and about 30% are on the Internet. What about other services? Prodigy (13%), America Online (11%), MCI Mail (2%), and BIX (1.1%). Based on this feedback, we'll be continuing our presence on CompuServe's OS2AVEN forum, and our editors now have direct Internet mailboxes.

Another part of the survey confirmed that we're giving you the right types of articles. The survey told us that you don't want profiles of major advertisers and interviews with off-beat OS/2 users. Great! We've never printed those types of articles and we never will. What you did vote for is more of what we've offered since our premiere issue: how-to tutorials, explorations of new technology, hands-on product reviews mixed with practical news and analysis, new-product announcements, and tips 'n tricks. So, we'll keep the hard-core information coming.

Don't wait for the next annual survey to tell us how we're doing and what you want; Drop us a line, give us a call, send us e-mail. After all, we're here to help enhance *your* productivity under OS/2.

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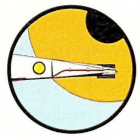

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Letters

The Phil utilities

Dear Editor:

I just finished reading "The Esther Utilities" in the April 1994 issue of OS/2 Magazine (pp. 50-56). I find the following five utilities as indispensable as the ones Esther Schindler mentions. They are, in no particular order:

INI File Maintenance, developed by Carry Associates, is a must for any OS/2 system, because it allows the user to access the OS/2 *.ini* files, which normally can't be accessed because they're binary. I can't tell you how many times I've used this utility to clean up invalid file handles and WPS objects. It's useful when deinstalling native OS/2 applications as well. When I removed Word Perfect for OS/2 from my system, this utility cleaned it off completely. And, it allows you to access extended attributes of all your files. You can contact Carry Associates at (813) 642-9126.

AMOS, for anyone like me who has both HPFS and FAT partitions on their hard drive, is a godsend. Developed by Allan Mertner, this utility allows you to access your HPFS partition from a FAT partition. It is installed on the FAT partition of your hard drive.

When you boot up MS-DOS (from Boot Manager), you type **amos** at the DOS prompt and the utility opens a window to your HPFS partition. You can see all your long file names and even edit your text files. Mertner developed AMOS to allow access to the OS/2 *config.sys* file in an HPFS partition in the case of an emergency. You can contact Allan Mertner at (617) 208-9224 or CompuServe 100327,2035.

WPS Backup is the best Workplace Shell backup utility, bar none. It was developed by Dave Lester and is used by every OS/2 user I know. I recently attended a meeting of the New York OS/2 Users Group, held at IBM headquarters in Manhattan and found that even IBM employees use this utility when running OS/2. You can contact Dave at (717) 235-7315 or CompuServe 75600,237.

Will customers have to wait until IBM produces a service release for OS/2 for Windows?

We all know how painful it can be to try to edit the OS/2 *config.sys* file. For those of us who are unfamiliar with its intricacies, editing *config.sys* can be an intimidating task. ConfigWiz, developed by VacNat Software, makes this task much simpler. Instead of calling up the actual *config.sys* file into an editor, this program creates a notebook-style interface that allows you to toggle all the system specifications. You can contact Kelly Schrock of VacNat at CompuServe 70572,1247.

PM Patrol is the newest of the five on my list; developed by Dave Wallenberg, it is an excellent system monitor. It provides a wealth of information about system resources being utilized, such as RAM, the size of the Swap File, CPU utilization, hard drive space, threads, and so on. It's not an attractive application, but the important thing is that it works, and very well at that. You can contact Dave Wallenberg at CompuServe 72702,2320.

Phil Lupetin
(via CompuServe)

OS/2 for Windows Bugs

Dear Editor

In the March 1994 issue of OS/2 Magazine,("Dateline OS/2," p. 11) Alexander Antoniades wrote about the update to OS/2, which is known as the Service Release. He mentioned that this update does not apply to OS/2 for Windows. I would like to know why?

In the same issue, Eric Pinnell mentioned that IBM had made some bug fixes for OS/2 for Windows ("OS/2 for Windows," pp. 28-35). The particular fix he mentioned, one that allowed Quattro Pro to be called by its correct name, seemed extremely minor. Some of the bugs that remain in OS/2 for Windows are major ones. I am concerned about support for this new product. OS/2 for Windows inherited many of the bugs found in the regular OS/2 2.1 release and it seems customers (including me) will be stuck with them. Will we have to wait until IBM gets around to producing a service release for this version, or even an entirely new release of OS/2?

Dave Clark via the Internet

Apparently, DOS and Windows code is modified differently enough from the OS/2 code base that the fixes for the Service Pak will not work with OS/2 for Windows. IBM announced that they will release a Service Pak for OS/2 for Windows, but haven't given a date yet. People have speculated that the Service Pak is being delayed because IBM is trying to fix OS/2 for Windows so it will work with Windows 3.11 and Windows for Workgroups 3.11. For more information on this subject, see Dateline OS/2 on p. 11 in this issue.

-Editor

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OS/2 vs. Windows 3.11

COMPATIBILITY PROBLEMS, UPGRADES, AND MORE

BY ALEXANDER ANTONIADES

Late last year, when the code-sharing agreement between IBM and Microsoft expired, many people wondered how long OS/2 could retain compatibility with the latest version of Windows. This dilemma was compounded by the success of OS/2 for Windows, which relies on its ability to modify existing Windows code to install properly.

Microsoft's first release after the breakup was Windows for Workgroups (WfW) 3.11, which was billed primarily as a maintenance release. It's understandable that WfW 3.11 doesn't work with OS/2 for Windows, since OS/2 didn't have peer-networking capabilities. And, Windows for Workgroups is different enough from Windows that it could be considered a separate product.

Windows for Workgroups still hasn't taken off like its successful sibling, Windows. But Microsoft didn't stop there; Windows 3.11, a "refresh" (as Microsoft calls it) of Windows 3.1, contained a couple of updated drivers and some minor changes to the kernel and GDI files (two of the key files of Windows). According to Microsoft, Windows 3.11 had "no new functionality or performance improvements, features, etc." However, from now on, Microsoft will primarily ship Windows 3.11, including OEM bundles. Oh, by the way, Windows 3.11 doesn't work with OS/2 for Windows.

Where does the buck stop? Microsoft pointed out that OS/2 for Windows patches Windows 3.1 in memory at fixed address locations, so that any changes in the base code would break it. But the question and answer file that Microsoft's PR firm distributed regarding Windows 3.11 talks more about why it doesn't work with OS/2 for Windows than what bugs were fixed.

Owners of Windows 3.11 can call Microsoft PSP Services at (800) 426-9400 for a disk that makes OS/2 for Windows work. According to a representative from IBM's PSP division, IBM is satisfied with Microsoft's patched disk solution, since IBM considers the problem to have been Microsoft's fault in the first place.

The wild card in this saga is the OS/2 for Windows Service Pak. IBM announced a special version of the Service Pak for OS/2 for Windows but has not given a release date. IBM officials originally stated that OS/2 for Windows would be updated to support WfW 3.11, but the official position now is that it will only work with Windows 3.1, which is now discontinued. Will the Service Pak work only with Windows 3.1 or will it work with Windows 3.11 and Windows for Workgroups? Nobody seems to know.

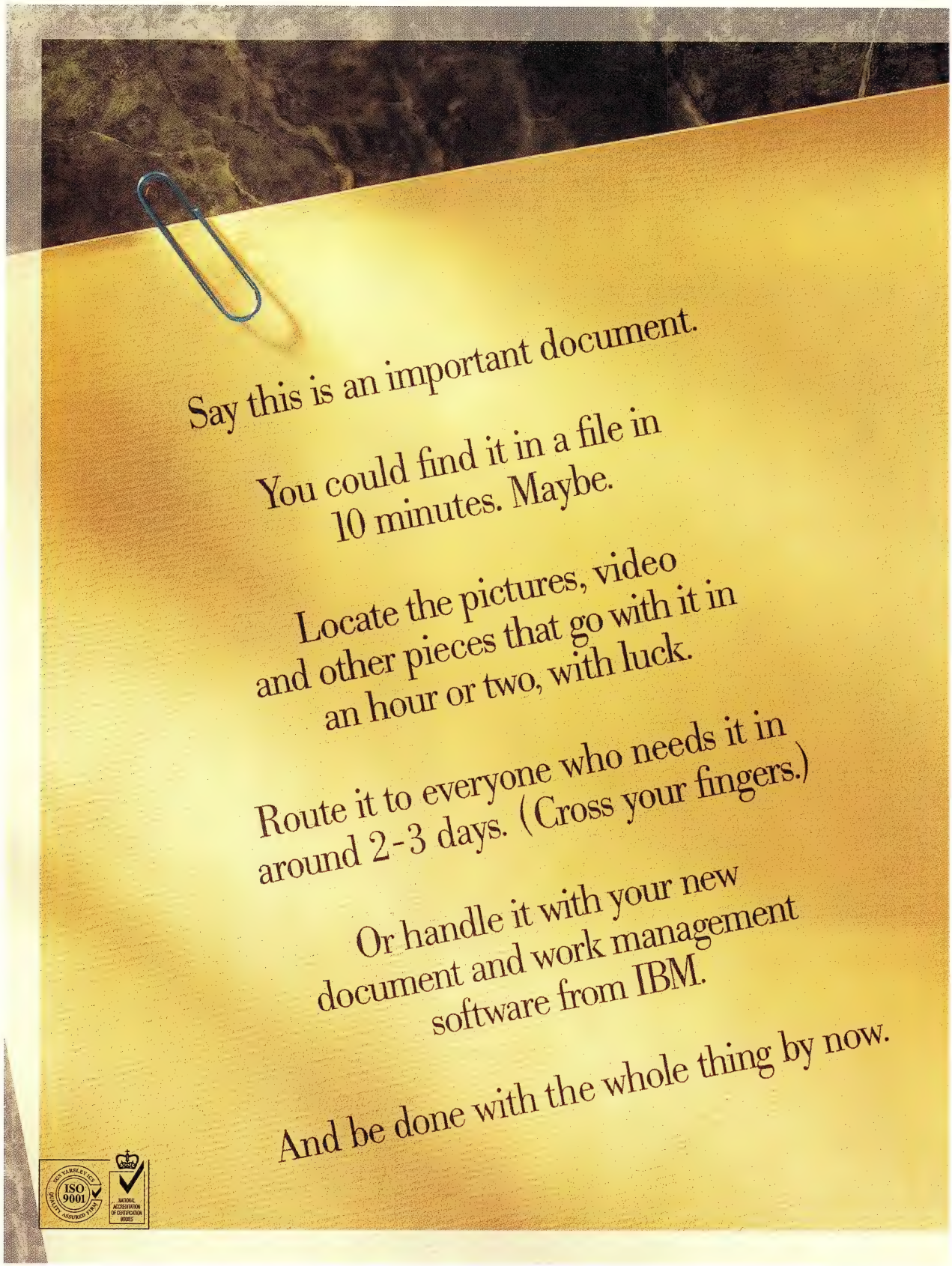
Service Pak/Release?

Is it the Service Pak? Is it the Service Release? Whatever it is, the maintenance release of OS/2 2.1 is here. But at what cost?

The Service Pak was originally priced at $40 for disks or CD-ROM. The price, IBM stated, was set to cover the cost of shipping and manufacturing. Customers disagreed: if smaller software companies can create and distribute CD-ROMs for as little as $15, why does IBM charge more than twice that? As a result of this outcry, IBM lowered the price of the Service Pak to $25 and will refund $15 to anyone who paid the original price.

The real question is, what is the Service Pak worth? It depends on your perspective. If you run an OS/2 machine hooked up to a network running server software from Novell, it should be worth a great deal. According to IBM, all known bugs in the Novell Netware requester due to faults in OS/2 have been fixed in the Service Pak. The other shoe will soon drop when Novell releases a new version of the OS/2 requester that fixes all bugs on the Novell side of the code. IBM officials stated that they will only support machines with Novell driver problems that are running the Service Pak, after an unspecified date.

A majority of comments have praised the Service Pak, but it has had problems as well. Initial problem reports have included bugs in the Tseng 4,000 drivers and Adaptec SCSI drivers, more changes in the *.ini* file structure, and, in some cases, you'll have to reinstall MMPM/2. The conventional wisdom is, if you don't need it, don't install the Service Pak.



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Reader Service No. 6

Driving on the information superhighway

THE RUSH TO CONNECT

BY AMY D. WOHL

It is only proper, in an issue of *OS/2 Magazine* that focuses on interconnection, to look at the role the personal computer will play as we move into that brave new world in which everything is connected to everything else via a global information superhighway.

So far, PC hardware manufacturers have been less than fully engaged in the information superhighway debate. A few companies (Apple and IBM, for example) have partnered up to build set-top boxes, thereby hedging their bets just in case PCs are priced out of the home market by lower priced set-top boxes as highway-connection devices.

Generally speaking, PC vendors have been scornful of the rush to populate a non-existent interconnection infrastructure with yet unspecified services. They point to the ventures companies have wasted vast sums of money on, such as artificial intelligence, pen-based systems, and multimedia. We can note that all three of these categories have something in common: they are not applications or business problems seeking solutions, but rather, technologies or groups of technologies that enable the building of better applications.

In fact, much of the frantic running about in search of the ultimate team to build the biggest and best information superhighway is really about two quite separate issues.

The first issue concerns capturing bandwidth. We have a finite amount of wireless capacity and appropriate real estate for building ground stations for wireless paraphernalia and supporting wires (of whichever technological age). Whoever has the biggest access to bandwidth and real estate has the best chance, all other things being equal, at capturing market share. With more than one possible technology capable of delivering information (telephone [via copper wire or fiber optics], cable [as in cable TV], radio wireless, and CDPD [cellular] for a start), partnering with companies that offer alternative technologies is a quick way to cover more bases.

PC hardware manufacturers have been less than fully engaged in the information superhighway debate

But, the possibility remains that a company might find a clever and cost-effective way to deliver all services through a single distribution technology. In this event, companies who invested billions to get quick access to alternate infrastructures (and billions more on debt service for their acquisition loans), may find themselves at a distinct disadvantage.

The second issue concerns content partners. Having a vast infrastructure is nice, but without a robust and varied set of services to offer prospective customers, this infrastructure is, like a mall full of empty stores, expensive and useless. Infrastructure providers need to be assured that there will be numerous services or else investing in distribution systems will seem uninteresting. Of course, there is also the possibility of participating in both the infrastructure and content sides of the equation as a supplier, with revenue flows from both. So, an interest in content is due, in part, to a desire to ensure an orderly start in an infant market and, in part, to a hope of participating in the content side of the market in an ongoing and highly profitable way.

The trouble is, no one really knows what the customers will be buying. Only a few million customers actually use on-line services today and most of them are fairly price-sensitive. They notice increases in prices and have clear budget limits for some types of services, such as entertainment and communications.

Builders of the information superhighway are counting on offerings being so seductive that customers

will happily pay any reasonable price for high volumes of service. We have no proof that this will be the case.

When one large e-mail provider increased its rates sharply, many users stopped or curtailed their usage or moved to another provider. Sophisticated users are quick to find the best way to obtain, for example, Internet service, ensuring the lowest cost per message. Good pricing information is available in this price-sensitive market.

Convenience is certainly worth something. We'd gladly pay to be able to painlessly download any movie at any time with no need to return it to the video store or pay a per-day late charge. But, we probably wouldn't pay twice as much. There are limits, and we don't yet know what they are. Will the different viewing habits of the occasional viewer, who has no need to see anything twice, and the happy family with four small children who want to watch their favorite feature cartoon every day be accommodated? Would, for example, the use of a film be free after the third viewing?

If I use a PC rather than a set-top device as my interconnection point (and, therefore, gain more capability), can I do more things? Would this capability be subject to the designs of the PC manufacturers and hardware features (like higher screen resolution or the ability to display multiple stations), or software publishers, providing additional control and the ability to manipulate information taken off the highway? Or, do I only have the rights the information providers offer, regardless of the device I happen to use? In that case, why would I bother using a PC, except for the fact that it's more convenient for me not to change my usual seat?

Therein lies the dilemma of the PC in cyberspace. PCs are arrogant and aggressive objects, especially in the hands of knowledgeable users. PCs are less likely to be used in a constrained fashion. Today, a 486 is a powerful computer, but it pales by comparison to what's coming at, say, the level of a PowerPC or even a Pentium.

The real question is: What will the information superhighway do for us and how will we use it? There is no doubt that change is coming; the only question is how that change will be directed and who, in the end, will direct the power that access to unlimited information can provide.

Amy D. Wohl is president of Wohl Associates, a consulting firm specializing in office information systems, personal computing, and end-user computing. She is also editor of the Trendsletter, *a monthly newsletter on computer industry trends.*

Reader Service No. 7

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IBM CAD/3X 3.02

SOMETHING OLD, SOMETHING NEW, SOMETHING BORROWED, SOMETHING BLUE... BY BRIAN PROFFIT

Each of these attributes is represented in CAD/3X. The heritage of the product would make up the "something old" part. Until now, this program was available only from IBM VARs as CAD PLUS. "Something old" would also apply to the character-based non-Workplace Shell interface. It is, however, a new package with a new price ($495), that's about one third of its predecessor's price. The entire product is borrowed, as it was developed by Altium, not IBM. And, the blue part. . . well, it does have IBM's name on it. (IBM acquired both the product and the company.)

Pay close attention to the product name, it's CAD/3X, not CAD/3D. It is not a three-dimensional drawing package. In fact, despite being an OS/2 application, it isn't Workplace Shell aware. For that matter, you can't even install it from a windowed command prompt—you must open a full-screen session. That is the first clue about how tightly integrated this program really is with OS/2.

User interface from hell

The installation program asks what type of display adapter you are using and modifies the setup accordingly. The program defaults to run only in a full-screen session accessing the hardware directly. The non-default, non-intuitive correct response is to select Presentation Manager. Further, the installation program initially said that I had no printer. When I tried to install printer support, it offered no Presentation Manager option to allow the program to use the installed OS/2 printer. Rather, the only options were an IBM 4019 printer (in LaserJet emulation mode), HP LaserJet, IBM Personal Page Printer, IBM ProPrinter, and IBM Graphics Printer. Forget all the OS/2 printer drivers. Emulate one of these, or don't print. After selecting my laser printer, I was told that I could only print at 150 dpi unless I had additional memory in the printer. (Of course, OS/2 already knows that I have additional memory in the printer, but CAD/3X doesn't consult OS/2 much.) I was instructed to manually change a line in *\ibmcad\system\devices.cfg* from **Resolution=150** to **Resolution=300** if I had the additional memory. Didn't we move to OS/2 so we wouldn't have to have to be confronted with this kind of thing any more?

Plotting is restricted to devices that support the HP-GL protocol. Most devices do, but be aware of this requirement and don't count on the OS/2 plotter drivers to cover for other devices. CAD/3X can, however, output Computer Graphic Metafiles (CGM), which can be processed separately.

Even though CAD/3X can be manipulated to run in a window (or so I'm told—it didn't work in PM mode on any of my three test configurations, only full-screen), it is not a PM program. The interface remains thoroughly character-based, with non-standard menus and commands. I hate to spend so much of a review talking about a product's user interface, but it really doesn't matter how functional the program is if you can't use it. It's always a bad sign when a product includes a keyboard template (which only goes to F10) to remind you how to access its functions.

Running the program in a full-screen session may require that you stay in that session until you are through. CAD/3X didn't repaint properly on one of my test systems when I switched from its full-screen session to the WPS desktop and back.

It isn't all bad

However, the user interface has some nice aspects. I like the way CAD/3X highlights an entry when the mouse is moved over it to let you know exactly what is being selected, whether it's a menu item or an object on the screen. In really precise drawings, this feature can let you make selections of small embedded pieces without having to magnify the object repeatedly to differentiate the parts. And, while it isn't a 3D package, its support of isometric drawings allows perspective views that help serve the purpose. The on-line help includes illustrations—which is especially useful for a drawing package.

Another nice touch is that it gives you the ability to fit text between a specified set of coordinates, which is

Test Drives *cont'd on p. 22*

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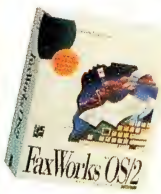

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Test Drives *cont'd from p. 19*

a lot easier than experimenting with point sizes until you get what you want. Other text support is also good, including some automation of actions, such as creating numbered lists and text that can be exported in ASCII format.

CAD/3X includes special features that differentiate a CAD package from a generic drawing package. For example, it can automatically detect the exact midpoint of a line. Building a new object off a center or midpoint is easy, when you get close to a point, it becomes highlighted. Clicking anywhere in the vicinity moves the pointer exactly to the point, eliminating fumbling with hypersensitive mice to get the crosshairs right on the spot. Drawing perpendicular lines is simple, regardless of their angle in relation to the screen origin. Engineers will appreciate the fact that CAD/3X includes some sophisticated object-analysis techniques, such as finding the center of mass, radius of gyration, principle axes, and moment of inertia of a drawn object.

It isn't unusual for a CAD package to allow the development of "layers" so that you can effectively draw an object from the back to the front on the Z axis. You can selectively show or hide underlying layers to reveal the interior of the object being drawn. Another nice feature, not found in many other packages, was CAD/3X's ability to show or hide parts of the drawing based on their color. If you're designing a car, for example, this feature allows you to work specifically with the fuel system, cooling system, or electrical system by using different colors for each system's components. Of course, it would be more useful if the package supported the full range of colors your display adapter allows, rather than arbitrarily restricting you to 16.

It also isn't unusual for a CAD package to allow you to group parts of your drawing. Thus, your drawing is composed of views, which are composed of patterns composed of shapes. CAD/3X allows you to selectively look at specific parts of your hierarchy—a feature not found in many other CAD packages in this price range. The ability to merge two shapes using set operators (union, intersection, and difference) simplifies the creation of complex structures. Several pre-drawn drafting symbols are included, but I was surprised to see that electric schematic symbols were not.

CAD/3X supports macros, which can be made interactive to prompt the user as they are running. Creating a macro is as easy as starting the recorder and performing the actions as you would like

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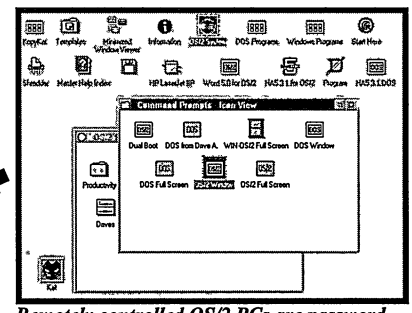

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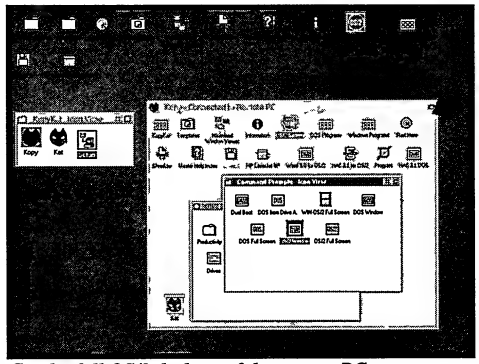

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Reader Service No. 10

the macros to execute them. The resulting macro file can then be modified with an OS/2 editor.

It is also possible to define your own function keys. If you perform a certain action frequently, you might assign it, for example, to <Alt+H>. Key assignment, however, requires more exposure to the vaunted user interface; in this case manually editing a text file with meaningful statements such as:

```
( 94 ASSIGN_TO || ( Ctrl F1 )
```

Performance was impressive on a 66MHz 486—it really flew. It was even acceptable on a 25MHz 386. As drawings get more complex, of course, things can slow down. CAD/ 3X always keeps your drawing up-to-date as parts are deleted and so on. This feature uses more system overhead, but maintaining a clean drawing is worth the extra resources.

Don't worry about losing your work. As you create your drawing CAD/3X constantly maintains a copy on disk, which can be recovered if a disaster arises. Your drawing is secure—even in the event of a power failure. Borrowing a term from OS/2, CAD/3X refers to this feature as "drawing crash protection."

The tutorial walks you through demonstrations of the key features. It is insensitive to hardware speed, though, and while it was instructive on a 25MHz 386, the actions happened too quickly to follow on a 66MHz 486.

Glee or Flee

This product is a quickly-ported DOS program masquerading as an OS/2 application. Its functionality is actually quite good, and will make a nice OS/2 program if IBM can find some OS/2 programmers to fix the user interface. But, let's be fair, if you're using a DOS CAD program, you're accustomed to this type of user-interface. For $495, CAD/3X allows you to draw under OS/2 more smoothly and with better performance than you could with your DOS program

---

Brian Proffit has been in the computing industry for 20 years. He was part of IBM's OS/2 team, left IBM to become the director of PC Week's *Corporate Labs, and is now the president of Visionary Research. Brian is the author of two books on OS/2, is a contributing editor for* OS/2 Developer *and* OS/2 Magazine. *He can be reached at CompuServe 75300,1466, or Internet 75300.1466@compuserve.com.*

RESOURCES:

IBM CAD/3X 3.02 ($495)
IBM CAD
P.O. Box 18375
Boulder, CO 80308-8375
(800) 442-6223; (303) 444-3377
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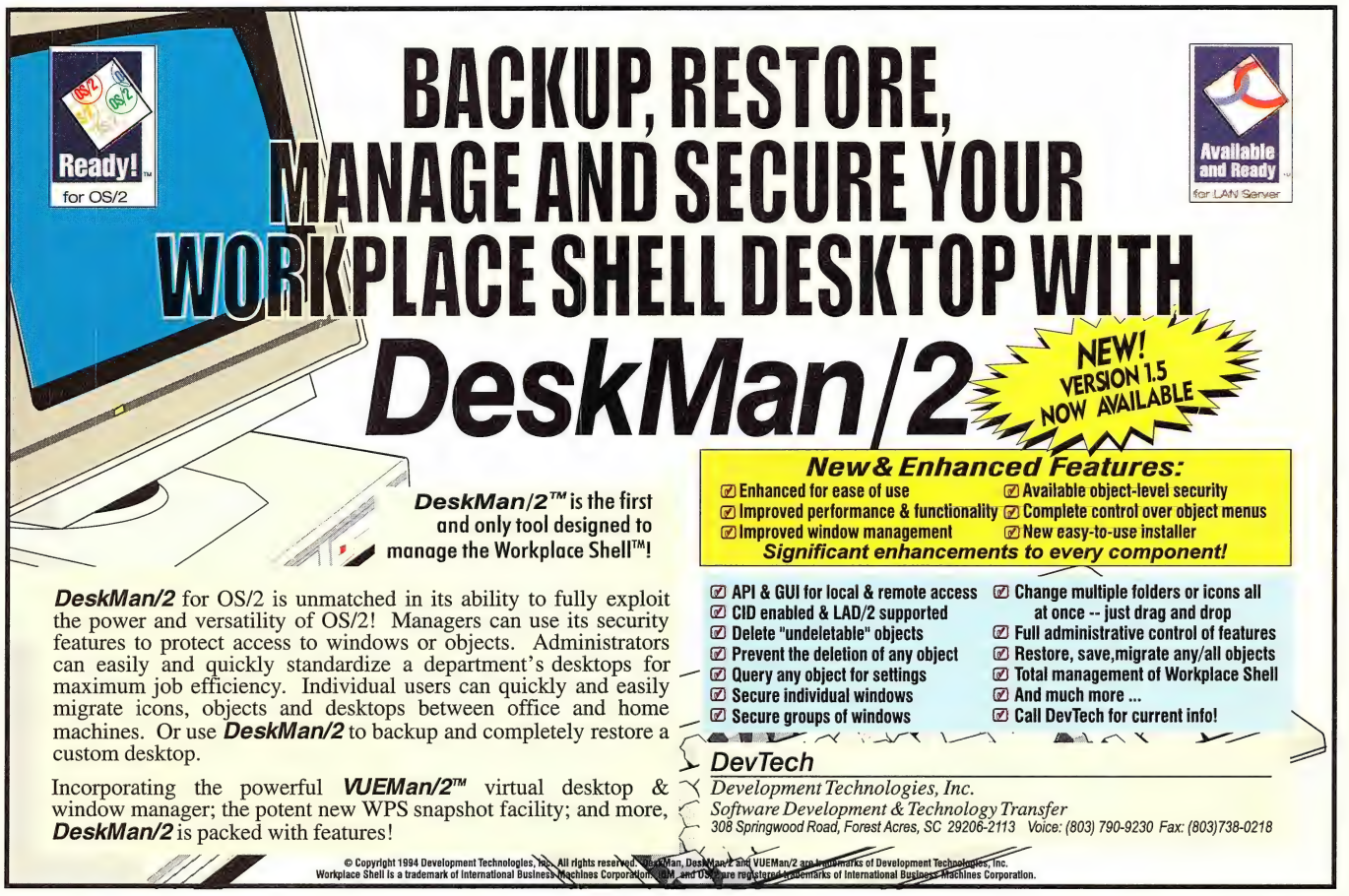

Reader Service No. 11

What you'll need to get started

BY KEN MACKIN

Networking in a Nutshell

The personal computer certainly ranks as one of the greatest inventions in human history. At your fingertips is a general-purpose machine, capable of mindlessly sifting and sorting through reams of incomprehensible data without a cry of complaint; enabling information to be abstracted from its containers to be mixed, sorted, edited, and applied with ease.

But for all this potential, the personal computer really hits its stride when it can communicate with other machines and their users. The venerable mainframe, with its copper arms reaching out like a nervous system for the corporation, lacks the creative potential of the workstation and the local-area network (LAN).

To achieve this potential, hurdles must be crossed. Just as the personal computer presents a serious learning curve to the novice, networking presents a similar degree of steepness for the average PC user or even OS/2 expert. So, let's discuss the basics of networking from an OS/2 end-user perspective, including some discussion on the various OS/2 network client programs.

Basic basis

Let's assume that we are working with a number of PCs, some running OS/2, others running DOS and Windows. What do you expect to accomplish? Electronic mail, expanded disk-drive space, printer pooling, a connection to another LAN on another floor, and dial-up service so that people can dial in from home, from client offices, or when traveling.

Once you have a clear idea of what services (or applications) you want to provide to your internal customers, and have a sense of the computer equipment already installed in your office, the next step is to ask a few physical questions: Does your company have wiring in place? If so, is it capable of supporting a LAN?

I once performed a network installation for a firm that had coaxial wiring for mainframe terminals throughout the building. The firm only wanted the basics and didn't have the resources to rewire, so we implemented simple and cheap ARCnet. It worked well, and the customer was happy. Less than a year later, they wound up moving to a new location—so the rewiring costs would have gone down the drain anyway. Try to use what you have.

If your firm runs OS/2 on many of its PCs, there's a good chance that you also have an IBM legacy. If there's a mainframe on the premises, consider some type of SNA (Systems Network Architecture) link. Mainframes have enormous data storage capability and enviable reliability. A mainframe link will also enable users currently stuck with dumb terminals to move up to OS/2 while allowing them to continue to use the company's existing applications.

Let's get physical

If your building or offices are unwired and you're not planning on moving soon, you'll need to work with a cable installer. Keep the following points in mind:

- If it is the first time you've run cable, consider hiring a consultant to help you avoid costly mistakes.
- Carefully consider the approaching combination of voice, video, and data over LANs. Planning excess capability today for this upcoming revolution could save you lots of money later.
- Utilize a competitive bidding process, but don't automatically award the contract to the low-balling bidder. Be smart and careful. Check references.
- Avoid firms that only work with one cable manufacturer. Vendor independence is good insurance that the cable plant is designed to meet your needs, not the contractor's.
- Avoid buying equipment from one vendor, then hiring another vendor to install it. You may wind up with more finger-pointing than functionality.
- Test the cable before and after installation.
- Hire another firm to certify the work before acceptance.

Be warned: If part of the cabling doesn't meet the necessary performance specifications, you can spend a lot of time, money, and political capital fixing it. Get all certification in writing—it gives you a basis to insist the that the cable firm fix any problems that arise.

Figure 1: The network layer cake.

Wiring: The wire the network runs on.
Topology: The physical organization of the network and the method by which electrical signals propagate on the wire.
Protocol: The organization of data into "packets" which can be transmitted, received and understood by stations on the network (the morse code of the network).
NOS: Software which manages the access to data between user nodes and servers nodes on the network.
Application: The highest layer of the network, this is the layer where the network provides value to users.

Lay of the land

Once you figure out the basic wiring issues, turn your attention to the architecture and protocol issues. How are you going to lay the network out? Are you going to choose NetBEUI, IPX, or TCP/IP as your base protocol? Architecture is one of the most important decisions you will make as you build your network. Fortunately, you can change architectures if your initial calculations of usage are wrong or if your company's needs change.

The basic topologies in the Ethernet world are the bus, the star, and multiple-star network. The bus looks like a centipede with connections to nodes constituting its legs. The star is a network layed out around the concept of a "hub" that has direct connections to each station including the server. The token ring analog to the hub is the multi-station access unit, or MAU.

The bus network typically uses wire that is similar to that used in cable television installations—coaxial cable—which is simple and cheap.

The bus network typically uses wire that is similar to that used in cable television installations—coaxial cable—which is simple and cheap. But star networks based on the more sophisticated 10BaseT and twisted-pair telephone wire are the way to go for an Ethernet network.

The multiple-star network uses a "backbone" to connect independent stars. This configuration is the most effective solution if your site plan allocates individual stars for each department. If your site is large or your data needs involve computer graphics or the emerging technology of video conferencing, consider running fiber optic cable on your backbone and perhaps even to the desktop. If fiber optic cable is out of the question, solutions like Thomas Conrad's TCNS or CDDI can provide up to 128Mb/s (megabits/second) over coaxial cable. The cost of TCNS at least, is surprisingly low, although Thomas Conrad is the only company currently supporting it.

The Fast Ethernet Alliance is producing 100 bps Ethernet that runs over four-wire twisted-pair telephone cable. It has the advantage

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of being backwardly compatible to existing Ethernet. IBM and HP are bucking Fast Ethernet in favor of "tokenless token-ring" technology dubbed 100BaseVG. The one major advantage of 100BaseVG over 100BaseT is that VG promises guaranteed bandwidth for video. Standard Ethernet is based on a scheme called CSMA/CD, which means that any node on the network can transmit and collisions are permitted. That technology doesn't fly very well with video because video collisions on a CSMA/CD network mean garbled pictures.

Wire diplomacy

Once the topology and wiring issues are on the table, the next step is to decide the base protocol that most stations will need to communicate with each other. Literally dozens of protocols are floating around these days. The two basic choices are Novell-supported IPX/SPX and TCP/IP from most everybody else (Novell supports it too). If your network might grow to any appreciable size,then learn more about TCP/IP. If it will consist of a single segment or three and your network operating system (NOS) choice is NetWare, there is nothing wrong with going with IPX.

If your choice is IBM LAN Server, you can run the preceding choices or IBM's NetBEUI (which is not a true protocol). NetBEUI has only modest support and IBM's recent announcement of more TCP/IP is only adding fuel to TCP/IP's dominance in the murky world of protocols. One advantage of NETBEUI is that it allows an IBM LAN Server network to support load balancing among as many as four token-ring cards on a single segment. Most other designs allow the server to support only one card per segment. If your network is or will be very large, keep this fact in mind. But your problem is to get a network up and running, and all of these technologies work.

Much ado about not much

Much attention has been paid to the network operating system. But at this point in the development of network technology, the differences between the various NOSs are becoming less important for the LAN. They all provide basic file-access management, print resources, client access, and security. Current NOSs are differentiated by their ability to support large enterprises, the number of third-party applications written for a specific NOS, and their implementation cost.

OS/2 was conceived by Microsoft and IBM with the network in mind. In their view, the LAN operating system should be seen as an application and a seamless extension of the workstations—all part of a powerful network of interacting computers. Unfortunately, OS/2-based NOSs didn't do very well in the marketplace.

The advantages of IBM LAN Server for a network of OS/2 machines are not well understood. The NOS supports Advanced Program-to-Program Communications (APPC) and Advanced Peer-to Peer-Networking (APPN) software. These software programs allow a large system house to design custom transaction-oriented databases. An APPN node switches roles from client to server as needed. A client is a process that needs a piece of information and a server is a process that might have that information.

If an APPN server doesn't have the data, it can ask another server for it. In other words, the environment comes very close to providing a framework for distributed processing. IBM has a demo APPN program that uses all of the nodes on an APPN network to generate complex fractal designs on one machine while using the horsepower of all the other machines on the network. Very slick.

Contrast Microsoft and IBM's definition of a network with the tenacious and overwhelmingly successful NetWare. NetWare 3.x is much closer to a terminal-host architecture in concept, with a workstation "attaching" to specific server(s), rather than having a relationship to a "domain of resources" as in the Microsoft/IBM concept. In part, Netware's success is due to its conceptual limitations. It requires no theoretical leap because it reflects the level of understanding already possessed by most mainframe users.

If you are leaning towards a NetWare environment, NetWare 3.12 will also provide more than just basic functionality. NetWare is easier, in some respects, than OS/2 and LAN Server because it is one operating system as opposed to two. NetWare is an extremely fast NOS because its streamlined design

Take a look around

Before you begin to consider networking hardware and software, learn what the latest applications can do to help your business work better. It all starts with applications. The fastest computer is the world is useless unless some good software has been written for it. Think application, infrastructure, implementation.

The first thing on your list should be an analysis of currently installed technology. Maybe your firm runs an old UNIX system that takes 40 minutes to perform certain procedures. Could an Oracle database running on a token-ring network provide performance advantages? It might.

Maybe you have an IBM mainframe running PROFS or OfficeVision and think that more powerful LAN-based e-mail would speed up the pace of business and provide new capabilities. It might.

It all depends on your firm's commitment (past and present) to implementing technology, and your visions in achieving success by wringing every last drop of productivity out of the equipment.

has very few "extras." But the leanness shouldn't obscure the massive library of available third-party NLMs. Database, backup, communications, and management programs from third-party vendors are available and work quite well—but make sure you figure these costs into the basic network cost before you choose.

These NOSs vary widely in "cost per seat." NetWare costs about $80 per seat. LAN Server costs between $21 and $80 per seat, depending less on the number of nodes. Sit down and figure out the money issues before you start, and don't "stakedrive" management by under-selling the true costs of networking—in componentry, installation, and support. It'll only come back to haunt you.

Getting the connection

Machines running OS/2 need a special program called a "requester" before they can connect to a network. The requester is a specially designed client providing uniform access between the network to all separate multitasking processes on an OS/2 box. By contrast, with a DOS client, the network-access software sits in real-mode memory somewhere below 1MB in RAM; in most cases even below 640K.

The advantage of the OS/2 requester architecture is that it allows the network-access software to reside anywhere in memory. And because it's OS/2, it makes all your separate processes, whether they be DOS, OS/2, or Windows, think they have a special connection all their own.

OS/2 requesters are available for Novell, IBM LAN Server, Microsoft LAN Manager, Windows NT Advanced Server, and Banyan VINES. While these clients all give you basic network access, the differences reveal themselves as basic design differences in the network operating systems. The IBM LAN requester has special features that use the facilities of LAN Server, for example.

The NetWare Requester for OS/2 exists in three versions, each designed for different implementations of OS/2. Many people have been disappointed in Novell's product because it forces an OS/2 user to adopt the DOS drive conventions typical of NetWare.

I know a network manager for one company who refuses to allow his users to run OS/2 on their desktops because he has found that the NetWare Requester is a support headache. If the network is down when you try to log in, the NetWare Requester is slow to recognize the condition, and it delivers arcane error messages when it figures there's a problem.

The IBM LAN Requester and Microsoft Requester for OS/2 are smoother in their OS/2 design and allow for the use an alias in place of abstruse DOS drive letters. The IBM LAN Requester allows an OS/2 network the ability to share processors and hard drives through the use of APPN delivering a distributed-processing prototype.

While Microsoft and IBM LAN clients also slow the boot process when the network is down, they are much quicker to respond to error conditions than their Novell counterpart. None of the Requesters are true Presentation Manager components although I've heard rumors that the next release of IBM LAN Server will include one.

Small steps

Its perfectly okay to take "baby steps" by networking one department at a time, to learn the ropes and build internal confidence. The only exception to this is in wiring. It will be much cheaper in the long run to wire the whole place at once—especially when you are constructing new office space.

With the conceptual power and functionality that networks are providing, you can trim costs and provide better service to your customers at the same time. The important thing is to do it right. Ask your users what things waste most of their time; examine the business you are in. And remember, the whole idea is to get computers and networks to provide added value to the organization paying for them.

Ken Mackin is the president of Product Logic Corp., an industry consulting firm in Atlanta, Ga. He writes and lectures frequently about networking and products. He can be reached via internet as 76004.3626@compuserve.com.

RESOURCES

Beginner to Intermediate

Understanding Local Area Networks, by Stan Shatt (1993, Sam's Publishing). This book is a bestseller by a networking guru who can really write, and is a must read for those who need a good head start. It contains lots of useful information and touches on a number of advanced concepts in internetworking.

Building Local Area Networks, by Patrick Corrigan and Aisling Guy (1992 M&T books). This is a nice treatise on the construction of local-area networks with heavy emphasis on Novell NetWare. It is well-written with lots of useful examples.

PC Magazine Guide to Connectivity, by Frank J. Derfler (1992, ZDpress). This is a great overview book for people just starting out, but it is still quite useful for novices who want to know more. Includes a couple of floppy disks with utilities. Derfler is *PC Magazine*'s networking guru.

Advanced

Handbook of LAN Technology, by Paul J. Fortier (1992, McGraw-Hill). This book is an encyclopedic treatment of networking, with lots and lots of well-presented information on almost all types of networks and internetworks, with clear presentations on topics such as fiber-optic networks, IBM technology, and lots more—a great reference book.

Token Ring Networks, by Jesper Nilausen (1990, Prentice Hall). This is an excellent treatment of token-ring network architectures, which should be useful to many OS/2 users in Big Blue environments. It's a little on the dry side, but technically informative.

Running Remote Applications the UNIX Way Under OS/2

BY RICK COOK

X Windows on the Desktop

The X Windows System (also known as X Windows, or just plain X) is an outgrowth of MIT's Project Athena. By the mid-1980s, the school needed to run the graphics-oriented applications that were beginning to appear on UNIX on a variety of different workstations and graphics terminals made by a number of companies.

The big problem: There was no standard UNIX, and no standard way for UNIX to display graphical images on a terminal screen. Every manufacturer had its own version of UNIX, and most of them were incompatible to a greater or lesser extent. Not only was UNIX non-standardized, but UNIX graphics were wildly non-standardized.

Working with teams from Stanford and Digital uipment Corp., the MIT team came up with a minimal- solution. The solution was the X Windows System, ıich makes up in stern practicality what it lacks in theo- ical elegance. In fact, it was so practical, and the prob- ns it solved were so real, that it was quickly adopted by ınufacturers. Today, X is the standard way of handling ıphics in UNIX. In fact, X Windows is so standard that NIX graphical user interfaces (GUIs) such as Motif or enLook are almost all built on X. That fact alone guar- tees that just about any graphic UNIX application is X- npliant. But, best of all, X, as a graphical standard, can ı on other operating systems—including OS/2.

The X Windows world is divided into clients and servers, which are both pieces of software. However, X uses the terms inverted from most other applications: the client is usually located on a remote system, the server is on someone's desktop PC or terminal, and the client and server are generally connected via a network. (It is also perfectly possible to have the client and server running in the same computer.)

X Windows got its start on UNIX and is still most closely associated with that operating system. However, by its nature, X is universal. You can run X applications on any system that supports X software, which, in theory, is most of them, as long as you have an X server for your computer. Currently, two X Windows servers are available for OS/2: IBM's PMX, and Hummingbird's Exceed.

Why X Windows?

The major advantage of X Windows on OS/2 is that you can easily integrate applications running on other operating systems into the OS/2 environment. You can start a foreign application by clicking on a desktop icon, the application comes up in a Workplace Shell window, and you can transfer information to and from the application with the clipboard just as you can among OS/2 applications. In fact, you might have to look closely to see that you aren't running a native OS/2 application. Underneath it all, X is busily transferring things back and forth and taking care of the messy details.

Okay, life isn't perfect. This rosy scenario depends on everybody—X client, X server, and application—playing by the same rules. In addition, X eats resources, notably network bandwidth, CPU cycles, and RAM. If you try to do something like a multitasking CAD application over X, things can slow to a feeble crawl.

For all that, life is probably more perfect with X than with any other current method of running remote applications on foreign operating systems, particularly under UNIX, where X is a *lingua franca*. You can even tune X to minimize the performance hit. X isn't something for nothing, but it can get the job done.

If X sounds like a fancy terminal emulator, it is more than that. Unlike a conventional big computer-and-terminal architecture, the X client doesn't know and doesn't care what the X server's hardware or system software is like. In fact, you could run dozens applications resident on multiple remote machines. To your desktop machine, those X client applications are just other OS/2 applications, and you can exchange data with them easily. True, terminal emulators can perform this task in some cases, but not in an application-independent, operating-system-independent way, and usually not with support for multiple graphics sessions in tight integration with the native desktop applications. In fact, if you want desktop data exchange in a graphical application, you're usually rather severely limited in your choices of applications and terminal-emulation packages.

X Windows doesn't just turn your desktop system into a terminal. In fact, it adapts the remote application to your system by splitting the execution of the application between your desktop and the remote system, with your computer handling all the graphics and user interaction. This approach makes it much easier to exchange data between the remote system and the desktop.

Another advantage is speed.

Figure 1: Although the X Windows system was originally designed to run over a network, client applications can also run locally.

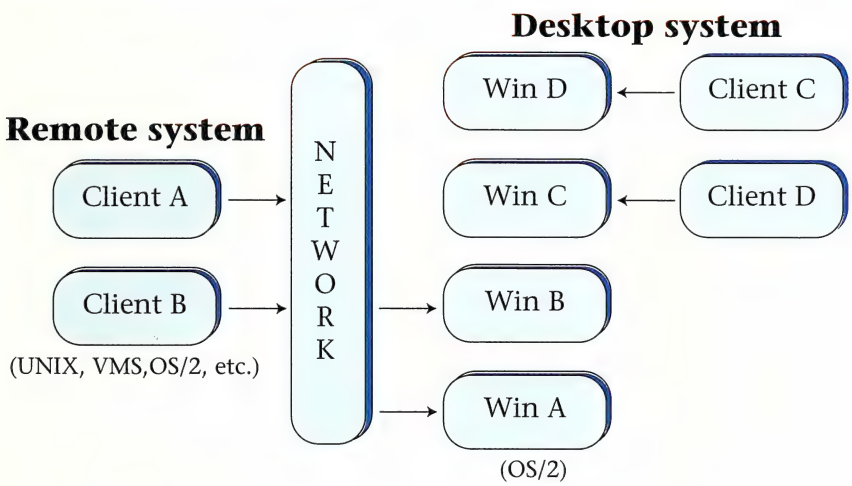
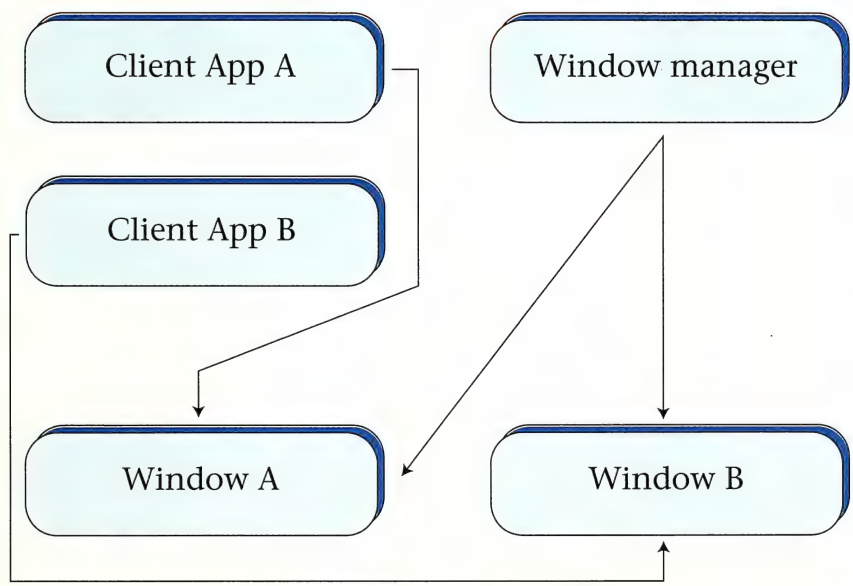


Figure 2: In X, the contents of the windows and their controls are handled by the window manager, which is another client.



Because X Windows unloads a lot of the graphics work and housekeeping (and because it assumes the underlying network protocol is reliable), X applications running remotely tend to run faster than applications written for terminals. (Not as fast as native applications, of course.)

Perhaps equally important, X can be extended and customized. X is written so everything that can be is handled as an extension rather than as part of the main X Windows—including the GUI and the windows manager. To the server, the GUI and windows manager are just X clients.

X Windows offers a clean, consistent method for expanding its own capabilities. For example, 3D graphics were not specified in the original versions of X, but the consortium responsible for X Windows later decided to use PHIGS, producing what is called the PEX extension. If you don't want to use it, another available graphics extension is based on Silicon Graphics' OpenGL. Other extensions handle desktop video and Display Post-Script. More are on the way.

Why X on OS/2?

X Windows is especially valuable on OS/2, not so much because of the technological capabilities—after all, you can do just about anything X does with OS/2's client-server architecture—but because it solves some important business and strategic problems for OS/2.

By its nature, OS/2 tends to be part of an enterprise-wide approach

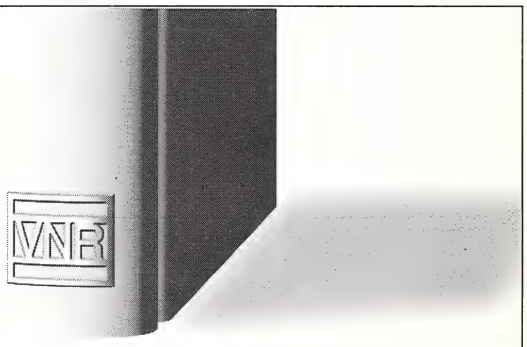
Clients, servers, and X

One of the most confusing things about X-speak is that what it calls a "client" the rest of the world calls a "server" and vice-versa.

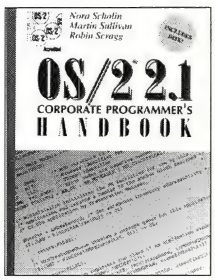
In the world of X, a "server" is a program that runs on the user's machine, be it a terminal or a computer. It works with the X client built into the application to interpret messages from the client into things on the screen and to send the client "events" (key presses, mouse clicks, and so on) in a form the client can handle.

This reversal of terms comes about because of the focus of the originators of X, which was on applications not hardware, and the terminal rather than the minicomputer running the application. From that "terminal-centric" standpoint, calling a client a server and a server a client is perfectly logical. After all, the purpose of the thing on the terminal is to provide services for the application, so it's a server, right? And the application being served is clearly a client.

Well, it made sense at the time. Like the name X, it's just something that happened and we're stuck with it, just as we are with Hotpoint refrigerators and jumbo shrimp.



Always start with a spinal exam.



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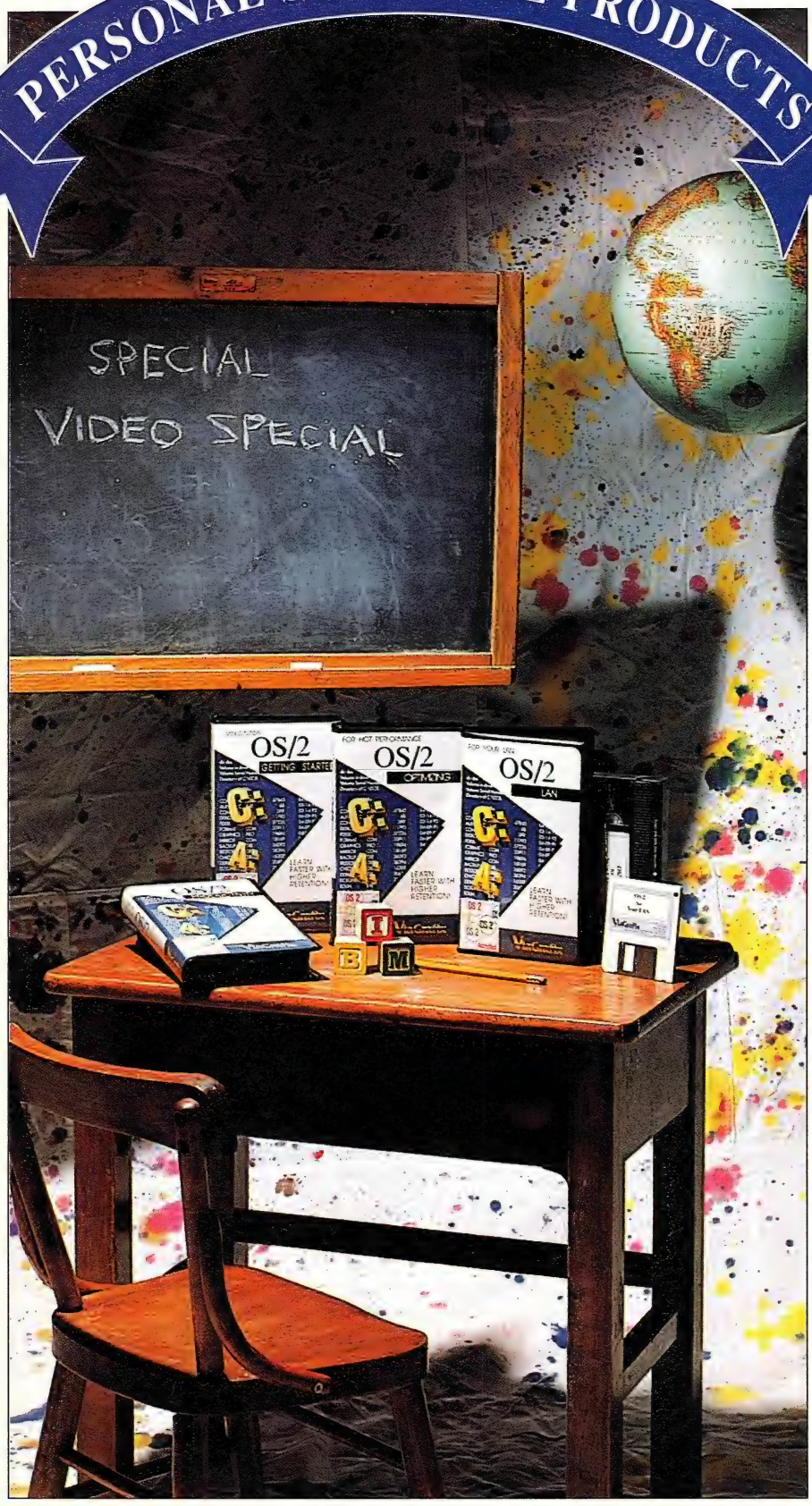

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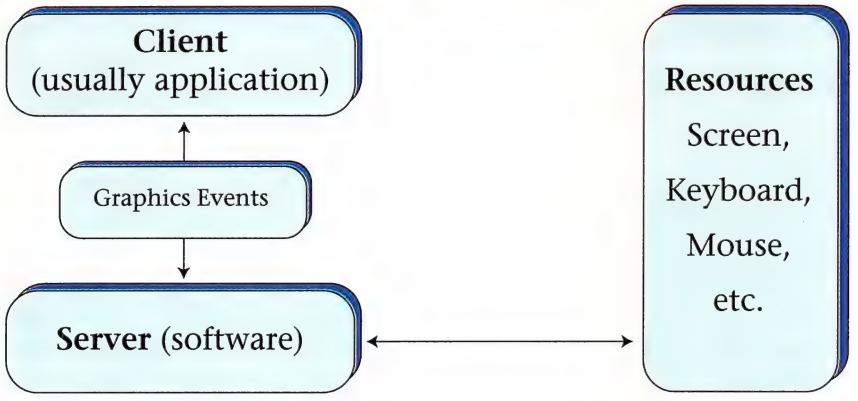
Figure 3: A basic diagram of the X Windows system. The client and server are both software and the server handles the resources to present the material on the screen and to send events such as key presses back to the client for client action.



to handling information. The central fact here is that most large servers (in the conventional sense) run UNIX or a 'big iron' operating system such as IBM's mainframe VMS, and that approach will change slowly if it changes at all.

Clearly, moving an enterprise to OS/2 involves a lot less risk if you can do it incrementally and continue to use existing applications on existing servers. Desktops, departments, and even whole organizations can switch to OS/2 and still not lose access to those X-based enterprise-wide applications.

X servers also make it easier to mix and match at the desktop. An organization can run PCs, Macintoshes, UNIX workstations, terminals, and OS/2 systems, and all of them can access the same applications via X servers. What's more, you can change the mix more easily, adding more OS/2 systems as time goes on.

Because X is so popular in the UNIX world, a wide range of application-development tools are available for it under UNIX. Most of the UNIX software being written today is GUI-oriented, which means it is X-oriented. The majority of that software is fully X compliant, although you can't make that assumption without specifically asking.

What is X?

The easiest way to think of X Windows is as a standard language for graphics displays and input devices combined with a standard communications protocol. The X

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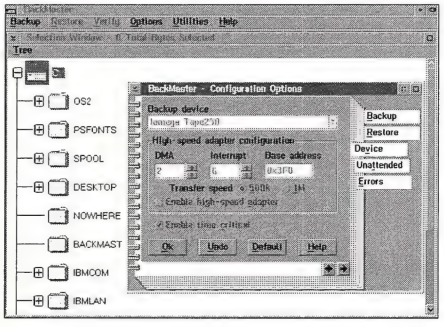

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X Windows IS HIGHLY OBJECT-ORIENTED. OBJECT ORIENTATION IS IDEAL FOR PROVIDING THE KIND OF DEVICE INDEPENDENCE THAT X DEMANDS.

client sends a series of commands and the X server interprets those commands and translates them into graphics on screen. The X server also recognizes keystrokes, mouse clicks, and other events and transmits that information back to the client to be acted on.

For example, the fonts the application can use reside on either the desktop X server or a separate software module called a font server. Instead of sending bitmapped fonts to the server, the client simply tells it the kind of font and its size and style. The server then supplies the bitmap, perhaps from the font server.

The advantage of this system is that it is universal. Any computer that can be hooked to a network can be made to understand X commands. The related disadvantage is that X is verbose. Because the system makes no assumptions about it, the server does a lot of work in expanding and translating commands, and an X session still requires moving a lot of data over the network.

The X commands are the basic language of X. They are contained in Xlib, a C subroutine library that is the basis of X programming. Together with high-level toolkits, Xlib gives X Windows a specific look and feel. Both IBM's PMX and Hummingbird's Exceed support one of the most popular X-based UNIX interfaces, Motif.

X Windows is highly object-oriented. Object orientation is ideal for providing the kind of device independence that X demands. Also, like OS/2's Presentation Manager, X is asynchronous and event-driven. The pieces of the X Windows communicate with each other by sending messages when something happens, whether it is a screen update or a mouse click. Basically, the X client is only responsible for what is happening in the window on screen. The window itself is built by the window manager acting on instructions from the client application. The look and feel of the contents come from the application, but the window manager controls the look and feel of the window and its associated controls, usually via a local client called a window manager.

Figure 4: X servers allow you to run multiple applications at the same time from OS/2.

Roads to X

You can get X operating on your desktop in two ways. You can use PCs or workstations running X server software or you can buy X terminals. You can also mix the two transparently.

With either approach, the first thing you'll need is a compatible networking protocol. As a practical matter, that means TCP/IP in OS/2 systems. IBM's PMX server is part of its TCP/IP protocol stack and uses IBM's TCP/IP for OS/2. Hummingbird's Exceed server works with a variety of TCP/IP suites, notably IBM TCP/IP for OS/2 1.2.1 and 2.0, FTP PC-TCP for OS/2 1.3 and Novell LAN Workplace for OS/2 3.0.

Getting the TCP/IP connection right is usually the most complicated part of setting up X servers. Although TCP/IP is a standard, like a lot of standards, it comes in different flavors. Once the TCP/IP link is solid, you need to make sure the client and server are singing the same piece of music. You must make sure the extensions the client expects are available and that various choices such as color maps are set correctly.

You also need to choose a standard method of starting application sessions from your desktop. X offers several choices, ranging from

using the built-in character-based terminal emulator to issue a UNIX command-line command to clicking on an icon. The most common method is to use XDM, the X display manager, to run a script that connects the server to the client application and starts a session. About five methods of starting a session are currently available in X, and which one you choose will depend on what is available (not all of them are on all X servers) and what the client application expects.

The future of X and OS/2

So where do we go from here? Probably onward and upward, with more companies entering the OS/2 X market and more tools, especially for software development.

Client software development tools are especially lacking right now. Even compared to the world of Windows (never mind UNIX), OS/2 is short on toolkits, widget sets, extensions, and other paraphernalia for writing software. You can write good usable client software with what's available, but a lot of bells and whistles aren't there yet. We will probably see developments in these areas fairly soon, and presumably other companies beyond IBM and Hummingbird will enter the OS/2 X client and server markets as well.

X Windows itself is also expanding. This summer, a new release, 11R6, is due out and will add some new features. A new version of Motif (2.0) is due to be released at the same time.

The bottom line: X fits neatly into the open-systems client-server world. In fact, for multiple OS environments, it is rapidly becoming the most common method of bringing remote applications to the desktop. Having X available is a big boost to OS/2.

Rick Cook has been writing about computers and high technology for over a decade. His first real computer was an IBM 1620 with 16K of core RAM. He has been writing about what became OS/2 since 1986 and about UNIX somewhat longer.

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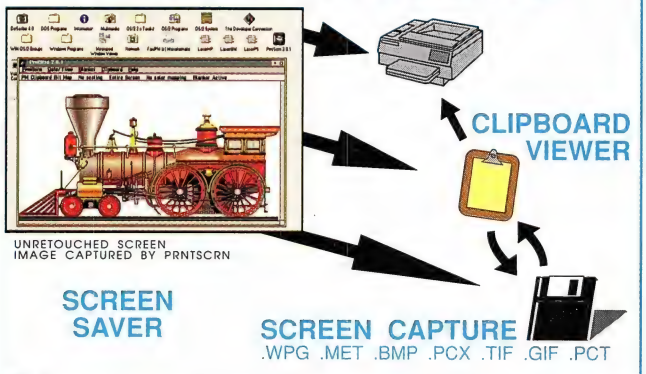

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NetWare Tuning with ODI

Optimizing the ODINSUP Network Driver under NetWare

by Bob Panza

Last month, we discussed how to optimize many of the *net.cfg* settings found in Novell's NetWare Client 2.01 for OS/2, also known as the NetWare Requester. We explored protocols, packets, Ethernet and Token-Ring frame types, buffers, and more. This month, we'll narrow our discussion to fine-tuning the NetWare Client if you're using Novell's ODINSUP driver as a means of accessing the network adapter.

A network board can be shared with IBM Extended Services, LAN Server, and LAN Requester. We will focus our interoperability illustrations on Extended Services (now sold as a separate IBM product called Communications Manager/2) for the sake of "simplicity." Nevertheless, interoperability provisions for Extended Services also form the basis required for joining the NetWare Client with IBM LAN Services.

Two NetWare Client for OS/2 drivers facilitate the implementation: *odinsup.sys* and *lansup.sys*. odinsup.sys allows Extended Services and LAN Services to use Novell's ODI network driver. In that case, the board is controlled and configured by ODI. *Lansup.sys* does the reverse. It enables the NetWare Client to use Extended Services, which retain control of the network board. (Next month, we'll delve into the process of fine-tuning the NetWare Client using *lansup.sys*.)

IBM communications software and NetWare Client software must be installed on the workstation so that all of the pieces are in place prior to operation over the network. The NetWare Client is installed and configured via the INSTALL program that comes on NetWare OS/2 Client 2.01 floppies. (Refer to "NetWare Made Easy" *OS/2 Magazine*, February 1994, pp. 30-42 for a cookbook approach to installation.) The IBM software can utilize a LAN Adapter and Protocol Support (LAPS) program for installation and configuration of the appropriate communication files and interfaces. LAPS is part of the IBM NTS/2 package residing in the *\ibmcom* tree. NTS/2 is analogous to the IBM LAN Support Program, which provides low-

Listing 1: *Protocol.ini*.

The **IBMTOK-nif** bindings line is remarked via **;** to deactivate the IBM Token-Ring MAC layer driver. The **TOKEN** bindings line below it replaces **IBMTOK-nif** in the stack to facilitate ODI downward to the adapter. The locally administered address **(LAA)** in **NETADDRESS** requires a corresponding **NODE ADDRESS 400010000BAB** entry in the **LINK DRIVER** section of *net.cfg*. If the adapter's "burned-in" address was used rather than an **LAA**, then the **NODE ADDRESS** entry in the *net.cfg* would not be required.

```
[LANDD.nif]
 DRIVERNAME = LANDD$
; BINDINGS = IBMTOK_nif
 BINDINGS = TOKEN
 LINKS = 41
 USERS - 4
 MAX_SAPS = 5
 NETADDRESS = "T400010000BAB

[IBMTOK-nif]
 DRIVERNAME = IBMTOK$
```

layer communication interfaces for workstations that are running DOS.

Software installation is easiest if the software to control the adapter is installed last. In an ODINSUP configuration, IBM software should be installed before the NetWare Client. For implementation of LANSUP or ODI2NDI, the NetWare Client software should be installed prior to the IBM software.

Implementation of *odinsup.sys* impacts the *protocol.ini* and *config.sys* as well as the *net.cfg* file. The objective in configuring for ODINSUP is to remove the Extended Edition interface at the Data Link MAC sublayer and to slide an ODI interface in its place.

Within the *protocol.ini* file resident in *\ibmcom*, all NDIS MAC driver lines need to be remarked out or deleted. For example, the IBM Token-Ring adapter NDIS MAC driver line is **BINDINGS = IBMTOK_NIF**. The line can be found in

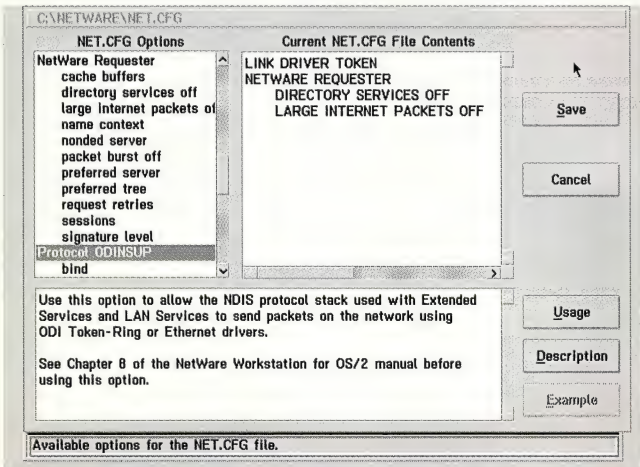

Figure 1: The NetWare Client *net.cfg* file may be edited through the INSTALL icon within the Novell folder. NetWare Requester and ODINSUP options are shown. The NetWare Requester settings impact performance while ODINSUP facilitates interoperability with IBM Extended Services using ODI drivers to control the adapter.

Listing 2: Changes in *config.sys* PATH lines.

IBM Extended Services adds **MUBLIB**, **CMLIB**, and **IBMCOM** directories, and their respective **DLL** and **APPN** subdirectories, to the *config.sys* path lines.

```
LIBPATH=.; C:\OS2\DLL; C:\MUGLIB\DLL;
C:\OS2\MDOS; C:\CMLIB\DLL;  C:\;
C:\OS2\APPS\DLL; C:\IBMCOM\DLL; C:\NETWARE;

SET PATH=C:\OS2; C:\MUGLIB; C:\OS2\SYSTEM;
C:\OS2\MDOS\WINOS2;  C:\CMLIB;
C:\CMLIB\APPN; C:\OS2\INSTALL; C:\;
C:\OS2\MDOS;  C:\OS2\APPS;  C:\RUMBAOS2;
C:\NETWARE; L:\OS2; P:\OS2;

SET DPATH=C:\OS2; C:\MUGLIB\DLL; C:\CMLIB;
C:\CMLIB\APPN;  C:\OS2\SYSTEM;
C:\OS2\MDOS\WINOS2; C:\OS2\INSTALL; C:\;
C:\OS2\BITMAP; C:\OS2\MDOS; C:\OS2\APPS;
C:\IBMCOM; C:\NETWARE; L:\OS2;
```

Listing 3: Changes in *config.sys* IBM communications lines.

The **ibmtok.os2** is remarked out to disable the IBM MAC layer driver. The other **IBMCOM** and **CMLIB** entires remain active. They preceed the NetWare Requester section of the *config.sys* unless LAN Services is implemented.

```
DEVICE=C:\IBMCOM\LANMSGDD.OS2 /I:C:\IBMCOM
DEVICE=C:\IBMCOM\PROTMAN.OS2 /I:C:\IBMCOM
DEVICE=C:\IBMCOM\PROTOCOL\LANDD.OS2
DEVICE=C:\IBMCOM\PROTOCOL\LANDLLDD.OS2
DEVICE=C:\CMLIB\ACSLDLAN.SYS
RUN=C:\OS2\EPW.EXE
RUN=C:\IBMCOM\PROTOCOL\LANDLL.EXE
RUN=C:\IBMCOM\PROTOCOL\NETBIND.EXE
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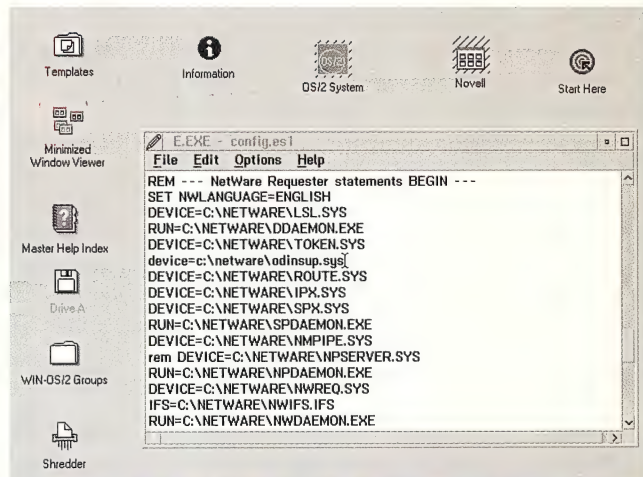

Figure 2: Using the OS/2 *e.exe* editor, the *config.sys* file is modified to unleash the *odinsup.sys* driver on Token-Ring. Control of the adapter remains with the *token.sys* driver. Communications Manager and LAN Services will run on top of ODI and must be configured with *net.cfg* settings in mind.

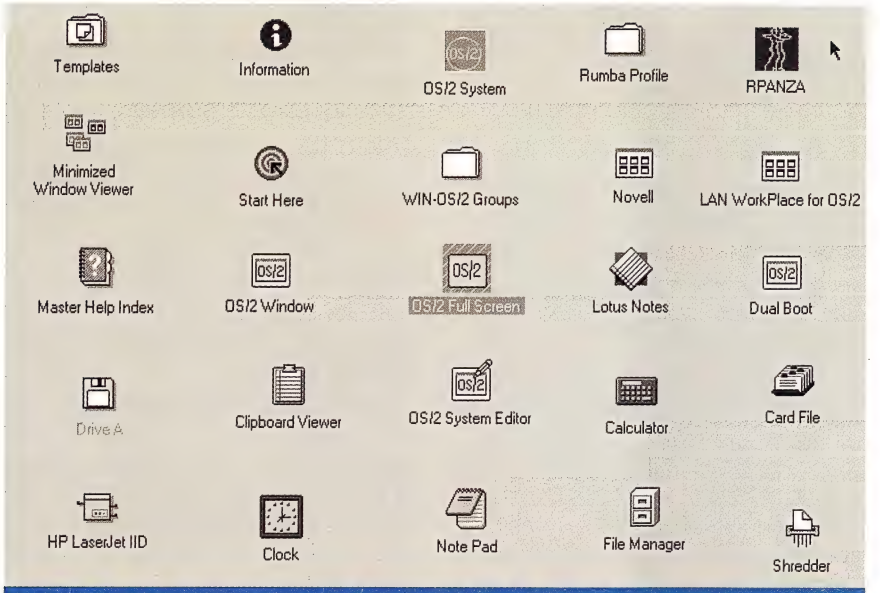

Figure 3: Various interoperability configurations make many things possible on the desktop. Novell's Open Data Link Interface (ODI) architecture was designed to be structurally accomodating. Multiprotocol communication adds functional flexibility for interworking across diverse enterprise-wide networks.

the *protocol.ini* file within the **LANDD_NIF** section (and **NETBEUI_NIF** section if LAN Services is configured). The new bindings line will be **BINDINGS = TOKEN**, assuming that we want to bind NDIS to the ODI *token.sys* driver of the NetWare Client. This new line must be entered into each section of *protocol.ini* where the NDIS MAC driver was found.

A second IBM Token-Ring board could be bound via **BINDINGS =TOKEN2**. The same logic applies to Ethernet adapters, such as **BINDINGS = NE2000**, replaces the NDIS MAC driver lines throughout the *protocol.ini* file for the Novell NE2000 board. At the end of the *protocol.ini file*, an empty header must be added for each ODI driver. The header would be **[TOKEN]**, for *token.sys*, preceded and followed by

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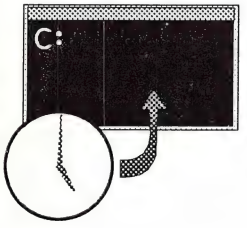

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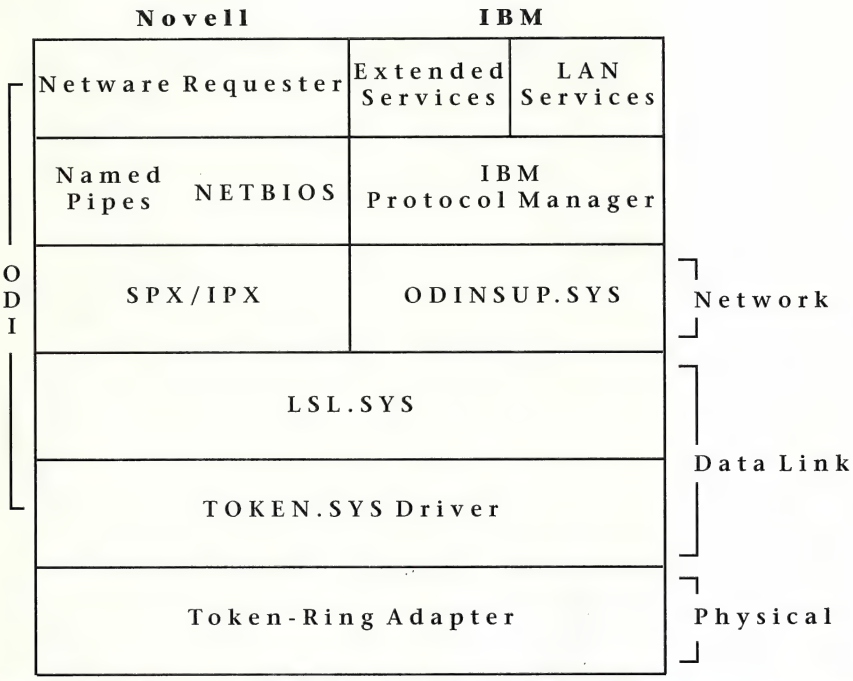

Figure 4: For IBM Token-Ring, the Novell ODI stack at the left side of the diagram appears as it would if no IBM software were present. IBM Extended Services and LAN Services interface with and utilize the lower layer ODI drivers via the specialized *odinsup.sys* driver. A rough comparison with the lower three layers of the OSI model serves as a guide to this innovative architecture.

blank lines.

Next, the *config.sys* file must be correspondingly changed to disable the NDIS MAC driver. Using Token-Ring as an example again, the *ibmtok.os2* driver line **DEVICE = C:\IBMCOM\MACS \IBMTOK.OS2** must be remarked or deleted. *Odinsup.sys* will need to be entered into the NetWare Requester section of the *config.sys* file following *token.sys*.

Route.sys will most likely be required to communicate across bridged Token Rings. *Route.sys* is not necessary if the workstation is on a routed ring since the router will place the source-routing information into the workstation's packets when necessary. Our *net.cfg* changes enable all frame types for Token-Ring or Ethernet:

```
LINK DRIVER TOKEN
FRAME TOKEN-RING
```


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```
FRAME TOKEN-RING_SNAP
LINK DRIVER NE2000
```

Listing 4: Changes in *config.sys* netware requester section.

Odinsup.sys resides in the *config.sys* following the ODI adapter driver—*token.sys* in this instance. IBM Protocol Manager preceded the NetWare Requester lines so it will be in place prior to the *odinsup.sys* load.

```
SET NWLANGUAGE=ENGLISH
DEVICE=C:\NETWARE\LSL.SYS
RUN=C:\NETWARE\DDAEMON.EXE
RUN=C:\NETWARE\TOKEN.SYS
device=c:\netware\odinsup.sys
DEVICE=C:\NETWARE\ROUTE.SYS
DEVICE=C:\NETWARE\IPX.SYS
DEVICE=C:\NETWARE\SPX.SYS
```

```
FRAME ETHERNET_802.3
FRAME ETHERNET_802.2
FRAME ETHERNET_II
FRAME ETHERNET_SNAP
```

The first frames listed in each section are used by the workstation when generating Get Nearest Server broadcasts and must correspond to the frame type generally used by default for SPX/IPX traffic throughout the enterprise. Otherwise, the Get Nearest Server will not attract the appropriate Give Nearest Server responses from NetWare file servers.

Because ODI retains control of the adapter, the other *net.cfg* parms are particularly important under the ODINSUP configuration. Our parm-tuning exercise will now pay off big dividends as we maximize performance and functionality. Finally, ODINSUP must be bound to the ODI adapter driver to complete the working *net.cfg* configuration:

```
PROTOCOL ODINSUP
  BIND TOKEN
```

or:

```
PROTOCOL ODINSUP
  BIND NE2000
```

Until Next Time

Next month, we'll conclude this discussion of how to fine-tune the NetWare Client for OS/2 by discussing the IBM Extended Services NDIS driver using *lansup.sys* and *odi2ndi.sys*.

Bob Panza is a LAN consultant affiliated with EJR Computer Associates in Hoboken N.J. and The Systems Expert in Woodbury, Conn. He can be reached via CompuServe as 71611,1262.

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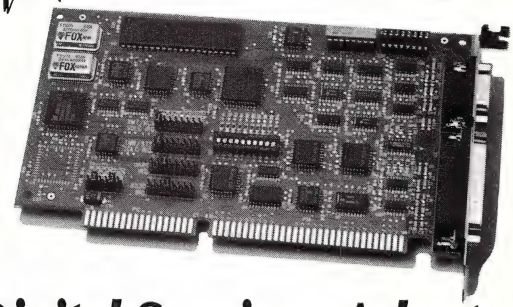

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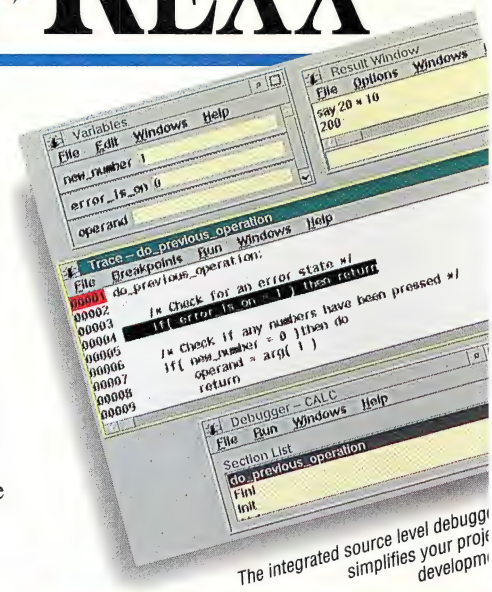

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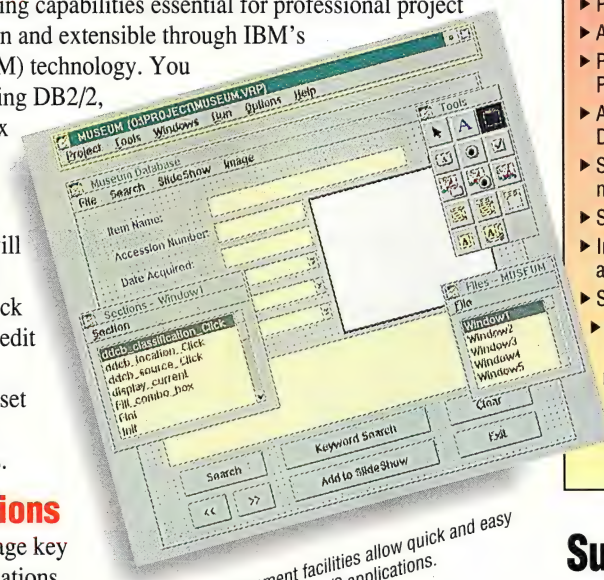

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Building a Customized VDM

Creating variations on OS/2's standard Virtual DOS Machine

By Brian Johnson

In today's business reality, it's difficult to run an OS/2-based PC with a full set of OS/2 applications. Many applications simply aren't available for OS/2, and many OS/2 products don't offer the full set of features and compatibilities we need. So, most of us still have hard drives filled with DOS and Windows applications. Our challenge, until OS/2 versions of these applications appear and mature, is to run those DOS and Windows programs as efficiently as possible.

OS/2 2.1 and OS/2 for Windows can run most DOS and Windows programs without modification. Both run these programs in a Virtual DOS Machine (what, in previous versions, was informally known as the "DOS Box"). Can these OS/2 VDMs be made more efficient?

Probably the most impressive feature of OS/2's version of DOS is that it can be completely customized. In OS/2, DOS users can create and test DOS environments specific to their applications.

Virtual DOS Machines

The Virtual DOS Machine (VDM) is just that, a virtual (or simulated) DOS computer that OS/2 creates so that your applications are fooled into believing that they're running on a plain old DOS or Windows computer on an Intel 386 processor. Here is where things can get complicated, or convenient, depending on your needs. The DOS that OS/2 uses to simulate a VDM runs a little differently than real DOS. For one thing, OS/2's DOS is unable to handle certain features that may be coded into native DOS software. These functions include LAN redirector hooks, internal control blocks, and undocumented DOS calls. For the protection of your system, and the secure OS/2 environment, OS/2 will restrict a DOS program's access to memory and hardware. In these cases, the only way to get around the problems inherent in OS/2's customized DOS is to boot a regular DOS version that is not held to these restrictions. We'll call this a "DOS image boot."

So which version of DOS is right for your applications? For most purposes, OS/2's special DOS is preferable for a number of reasons. First, it is optimized to run under OS/2. Second, because the OS/2 version of DOS is integrated with OS/2 itself, multiple VDM sessions can be booted and edited from Presentation Manager with little or no trouble. What about the other option? A DOS image boot requires you give up a bootable disk drive within its own session to boot the specific DOS version from a floppy drive, and you can boot a specific DOS image file only once. You can work around giving up a disk drive, but we'll discuss that option later.

OS/2's own DOS

Probably the most impressive feature of OS/2's version of DOS is that it can be completely customized. For DOS users, OS/2 is a playland where they can create and test DOS environments specific to their desires and applications. Through the Workplace Shell, you can create specific customized VDM DOS sessions and access them easily. To do the same thing from an ordinary DOS PC would, of course, require a reboot of the machine and perhaps crossed fingers, depending on the complexity of the changes to the system. Under OS/2, you should be willing to experiment. If a specif-

The easiest way TO CREATE A BOOTABLE DOS FLOPPY DISK IS TO BOOT YOUR COMPUTER INTO YOUR DOS VERSION AND THEN FORMAT A FLOPPY USING THE *FORMAT /S* OPTION.

ic VDM boot fails, you simply need to press <Alt+Esc> to get back to the OS/2 desktop. You can then kill the DOS session and adjust your settings accordingly.

To create a VDM object, open the Templates folder and drag the Program object template onto your desktop. This will create a new Program object, whose settings notebook will immediately open. Under file path and name, place an asterisk in the box. Under Session, check either DOS Window or DOS full screen. Next, click on the DOS Settings button. You are now presented with a set of DOS options ready to be customized.

Two features here are of particular interest to DOS devotees. The first is the **DOS_DEVICE** section. The **DOS_DEVICE** section allows you to specify device drivers and specifications to load into this particular DOS session. It is roughly akin to customizing your DOS *config.sys* file. By creating separate DOS objects for particular applications and needs, you can avoid having to use *config.sys* to load device drivers that you don't always need into every DOS session.

This approach also holds true for the *autoexec.bat* file. For example, Microsoft Macro Assembler (also known as MASM) requires specific **PATH** statements. You could install them in your system's *autoexec.bat*, in which case, all DOS and Windows programs would be saddled with MASM's **PATH**. This option sounds easy , but multiply it by the number of applications you use that might require custom **PATH**s, and it becomes less desirable. So, to prevent this exploding of the *autoexec.bat*, while ensuring MASM's functionality, you could create a custom batch file, perhaps called *automasm.bat*, that includes all of MASM's required **PATH** statements and other *autoexec.bat* functions. Then, specify *automasm.bat* in the MASM object's **DOS_AUTOEXEC** notebook section.

The real thing

As we discussed before, most of your DOS applications will run under OS/2's version of DOS but, in certain situations, you may want to run a genuine DOS version. In this case, we're going to create an object that calls a specific startup drive. It can be a bootable DOS partition, a floppy drive, or a disk image. (A disk image is a file on your hard drive that OS/2 can treat as if it were a complete floppy disk.)

You tell OS/2 to use a genuine DOS version by specifying the **DOS_STARTUP_DRIVE** for the particular DOS session you are creating. It would be entered as, for example *a:*, *c:*, or *(drive):\(path)\dosimage.img*. After specifying the drive or image to boot from, the **DOS_SHELL** section should include the path of the DOS's *command.com* file., such *a:\command.com*.

Some restrictions exist. You cannot use a real DOS version of either *emm386.sys* or *himem.sys*. If you've ever tried to boot your DOS partition under OS/2 and seen the words "Incorrect DOS Version" the reason is most likely that you're trying to use one of these files. The workaround is to have your DOS boot disk or DOS boot partition's *config.sys* file point to the OS/2 versions of these files. In most cases, it would be:

```
(drive):\os2\mdos\himem.sys
(drive):\os2\mdos\emm386.sys
```

The only problem here is that if you try to use these files when you boot your computer under DOS (rather than under OS/2), you'll have the same problem in reverse, since real DOS won't properly boot OS/2 *himem.sys* and *emm386.sys*. So, remember that you'll need to change these files again before you boot your machine under DOS. (You should also use the OS/2 version mouse driver in real DOS sessions, as other mouse drivers tend to behave erratically.)

Another option in running a real DOS session is to simply have the DOS object you've created point to the *a:* drive. In this case, you'll be able to create one object that is able to boot different versions of DOS through drive *a:*, depending on which DOS boot disk you put into *a:*. Remember, however, that the same restrictions apply as far as using *emm386.sys* and *himem.sys*.

There are a couple of drawbacks to using your *a:* drive for booting DOS. The most obvious is that you give up a floppy drive for the duration of the session—and that means that other DOS, Windows, and OS/2 programs can't use the drive, either. The second drawback is that using a floppy disk is *extremely* slow.

A perfect image

The best solution is to create a disk image file that *simulates* a floppy disk in drive *a:*. The process is straightforward: First, create a DOS Boot disk, and make sure it does what you need. Then, create an image file based on that bootable floppy disk. Finally, create a Workplace Shell object that accesses the DOS image.

The easiest way to create a bootable DOS floppy disk is to boot

your computer into your DOS version and then format a floppy using the *format /s* option. This approach will copy the files *ibmbio.com* and *ibmdos.com* in the case of IBM's PC DOS, or *io.sys* and *msdos.sys* in the case of Microsoft's MS-DOS, as well as the *command.com* command interpreter. You should use the smallest disk available for your drive (preferably 360K if you have a 5¼-inch drive, or 720K if you have a 3½-inch drive), as the image file you'll create will take up the same amount of disk space as the floppy disk's capacity—regardless of how much information is on the floppy.

You can test this new DOS floppy by either rebooting your machine with the floppy or running OS/2 and trying to boot the floppy from a program object with **DOS_STARTUP_DRIVE** defined as *a:*, and **DOS_SHELL** defined as *a:\command.com* (we'll name such a program object *a: drive boot)*. Note that you can only boot a physical floppy based in drive *a:*.

You'll also want to copy additional files to this DOS boot disk. Copy the *fsfilter.sys* from your *\os2\mdos* directory to synchronize the disk drives available to the boot disk within your OS/2 environment, including HPFS drives. You should also copy the *\os2\mdos* versions of *himem.sys* and *emm386.sys* to the floppy. Then, you'll need to create *config.sys* and *autoexec.bat* files, to steer your new DOS session in the right direction. For example, a *config.sys* for your boot disk might include:

```
DEVICE=HIMEM.SYS
DEVICE=EMM386.SYS
DOS=HIGH,UMB
DEVICE=FSFILTER.SYS
FILES=40
BUFFERS=30
LASTDRIVE=Z
```

and an *autoexec.bat* for your boot disk might include (assuming that *c:* is your OS/2 boot disk):

```
C:\OS2\MDOS\MOUSE
PATH C: \OS2; C:\OS2\MDOS;
C:\OS2\MDOS\WINOS2;
C:\OS2\MDOS\WINOS2\SYSTEM;
C:\; C:\DOS; C:\WINDOWS;
C:\WINDOWS\SYSTEM
PROMPT $P$G
```

Using this configuration, you would be able to run either WinOS/2 or Windows 3.1 in your new genuine DOS environment.

Once again, test your floppy disk by running it with the *a: drive boot* object created earlier. If all goes well, you should now be able to create your image file.

If you know that you're going to create multiple images of DOS on your machine, you should go ahead and create a directory specifically for DOS image files, such as *c:\dosimage*.

Let's say you created that DOS 5.0 custom boot disk. Reboot OS/2, open an OS/2 command window and change to the appropriate directory: *cd c:\dosimage*. With your bootable floppy in drive *a:* type *vmdisk a: dos50.img*. (You can actually name your image file whatever you want.) OS/2's VMDISK program will then create an image file in the current directory with the name and extension you specified. Oddly, you can create and use a disk image of a bootable DOS disk in drive *b:*, although you can't boot DOS from this drive directly.

The next step is to create a desktop object to access this DOS 5.0 image. Open the templates folder and drag the program template onto the desktop to create a new program object. Repeat the steps we took in creating our *a: drive boot* object, only this time, in the **DOS_STARTUP_DRIVE** section enter the full path and name of the DOS image file we created (like *c:\dosimage\dos50.img*), then set **DOS_SHELL** to that DOS shell's *command.com* (like *c:\dosimage\dos50.img\command.com*). Change any other settings you need to, but keep in mind that if you load the drivers in *config.sys*, the session's memory is being managed by *himem.sys* and *emm386.sys*, so some of OS/2's program notebook settings will have no effect. Next, go to the General settings page and change the title of the object to correspond with your version of DOS. You can now test your DOS image by double clicking on the object.

To edit the DOS image file, boot the DOS session itself and edit it from within. Once into the VDM, you can use *edit.com* or EDLIN to change the *config.sys* and *autoexec.bat* files before shutting it down to reboot. This DOS session believes that it was booted from drive *a:*, so you can access the files in that "virtual boot disk" accordingly. By the way, the EXIT command that closes down a normal OS/2 VDM will not close your custom DOS session, but you *can* shut it down by calling up OS/2 Window List and closing the session from there.

Once you've created your customized disk-image environment, you can regain access to drive *a:* within the VDM using the FSACCESS program by typing FSACCESS A: (but only if you installed *fsfilter.sys* in your disk image's *config.sys*, as recommended). If your *command.com* isn't specified in your VDM's *config.sys*, you will be prompted for the original boot floppy. Once FSACCESS has read that original boot disk, your custom DOS session will have access to all of your system drives.

Brian Johnson is a freelance writer and computer programmer in Orlando, Fla. He develops Windows applications under OS/2 for BizTrack Inc., and OS/2 applications for his own company, Katt Development. He can be reached on CompuServe as 72322,3611 or via Internet as brize@aol.com.

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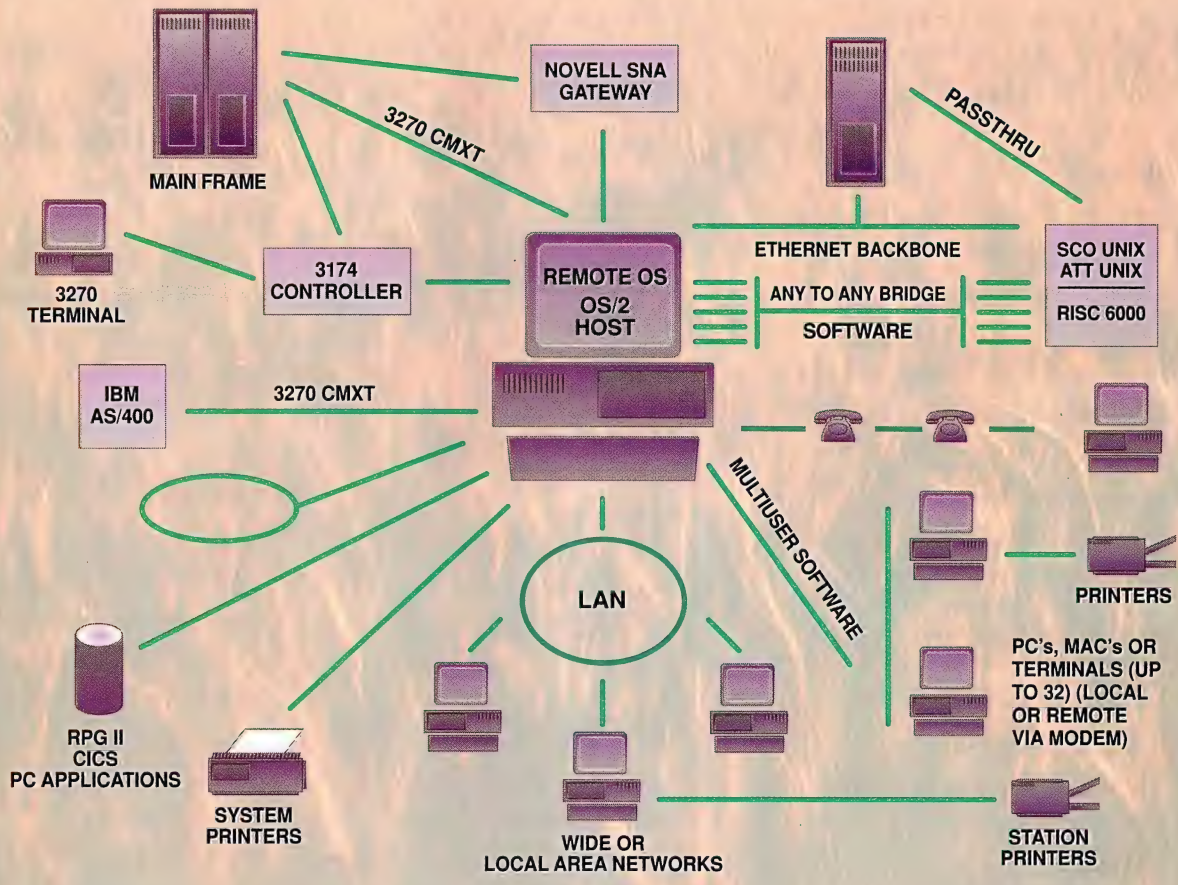

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A Tale of Five Databases

Alpha 4, DataEase, DataFlex, DB2/2, and R:BASE

BY CRAIG M. BOBCHIN

In the world of business software, one area that business depends on for much of its livelihood has been pretty much left to flounder under OS/2. While many databases are available for DOS and Windows, relatively few have been developed for OS/2.

Among the vendors that are supporting OS/2 are Microrim, DataEase, Data Access, Alpha Software, IBM, and XDB. Several other vendors have OS/2 databases in the works. One stalwart database vendor called Revelation Technologies has recently made the decision not to pursue any more development of their Advanced Revelation for OS/2.

For this review, we chose five OS/2-specific databases. All but one have a version for DOS and some have Windows versions.

The five programs that we chose are: Alpha 4 for OS/2, DataEase 4.53 for OS/2, DataFlex 3.03 for OS/2, DB2/2 (also known as DB2 Desktop), and R:BASE 4.5+.

How we tested

We tested the ease of use, features of each, the power to create applications, and the speed of imports and queries for each of the databases. In all cases, the same small employee database with two screens was created. For our data, we used a 30,449-record file in both ASCII and *.dbf* formats. The size of the data in ASCII was 4.5MB while the *.dbf* file was 6MB in size. All data was imported into the programs' native file format, even if it was able to use one of the other formats transparently. This way, all of the programs started from a level playing field.

The hardware setup was a 40MHz 386 with 8MB of RAM, OS/2 for Windows 2.1, a 90MB transportable Bernoulli drive, a Western Digital 540MB hard drive and a Quantum 170ELS hard drive.

All of the databases took up different amounts of disk real estate with R:BASE coming in as the biggest disk hog, needing about 15MB for a full installation. DataEase was the most conservative, chewing up only 7MB. The other three were all fairly consistent, needing between 10 and

Table 1: Features and maximums.

	Alpha 4	DB2/2	DataEase	DataFlex	R:BASE
Tables per database	9	32,767	2,000	255	1000
Columns per Table or view	128	255	255	255	2000 per database
Indexes Per Table	15	32,767	254	15	Table Limits
Records Per Table	2 Billion	4x109	16million	16.7 Million	Limited by Disk Space
File Formats Accessed	.DBF	DB2	.DBF, DataEase	Propriatary	RBASE, .DBF
Files Imported and Exported	Lotus 123, SYLK/MultiPlan, .DIF, ASCII Fixed Length, Delimited ASCII, Word Perfect Mail Merge, PFS:File	ASCII	ASCII Lotus 123, .DIF, .DBF, Multi-Mate, WordPerfect MailMerge	ASCII	Lotus 123, SYLK/MultiPlan, .DIF, ASCII Fixed Length, Delimited ASCII
Programming Language	Scripting	Cobol, REXX	Yes DQL	Yes	Yes
Query Language	No	Yes SQL	Yes DQL	No	Yes SQL
Transaction Processing	Partial	Yes	Yes	No	Yes
Cascading Updates/Deletes	Yes	Yes	Yes	Yes	No
Computed Columns	Yes	No	No	Yes	Yes
SQL Support	No	Yes	Separate Product	No	Yes
Memo Fields Per table	Up to 128	0	0	255	Table Limit
Security	Partial	Yes	Yes	Partial	Partial Via SQL Grant/Revoke

12MB for a full installation. If you don't install tutorials and sample databases, your disk requirements will be considerably less.

ALPHA 4 FOR OS/2 V. 3

Alpha Software

Alpha 4 was not designed for the programmer with many years of experience, but for the business person with a need to create applications easily. Alpha 4 is capable of creating some complex applications, but I would not use it for anything mission-critical. The *.dbf* file format that Alpha 4 uses has very little support in the way of integrity constraints or data validations. Any program that can access a *.dbf* file can make modifications without problems.

Alpha 4 is a system with its own place in the database world. It has some nice features; it is easy for even a novice to create fairly complex applications. While it doesn't offer a programming language, it has a scripting language that can be used to record macros for playback. You can also record keystrokes to create a script.

Compared to earlier versions, version 3 now includes mouse support. All of the menus fully support the mouse, and four new scripting commands make your applications mouse-capable. Since OS/2 relies on a mouse, this is a nice addition.

Alpha 4 has multi-file data entry, which lets you use data-entry forms containing fields from different database tables. The data from each table can be directly modified. You can also add new records to more than one table from the same form and display detail records in a scrolling child region.

Alpha 4 has some Referential Integrity features. It can automatically delete any child records when the parent record is deleted and, conversely, it will modify the linked fields in the child table whenever they are changed in the parent.

Alpha 4 includes lookup tables and posting to different tables. It has an outliner to assist you in creating cascading lookup tables. User selections can determine which lookup list to display next. It offers conditional posting to allow you to define a posting operation to be performed based on the data existing at runtime. The value of a Status field, for example, could be used to print an interim invoice and hold off posting it until a later date.

Performance

Alpha 4 is not the fastest DBMS out there, but its performance is nothing to sneeze at. It took under a minute to create an index on one field in our test database. In this area, it was faster than DataFlex but slower than R:BASE. Locating data based on an index is nearly instantaneous. When searching without an index, the results come back somewhat slower.

Creating an application is not difficult. The screen and report building tools are easy to use and intuitive, and the mouse can be used for all design tools including moving a field or text. Line and box drawing tools are also included.

Alpha 4, being a non-programmable database system, does not have a real programming language in the style of DataFlex or R:BASE; instead, it has a macro/script language. The language is able to handle any task you can think of. It supports conditional ifs and loops, along with support for variables.

A script can be called from a key press, triggering such actions as entry or exit from a field or a menu choice. Scripts can be used to create dialog boxes to prompt the user for information or just to display a message.

Alpha 4 is a nice end-user program that is useful for creating single and multi-user applications. The tools are top notch and, while it is not a speed demon, it is fast enough for daily work. If you need to quickly create a system and have no need to access data via SQL, then Alpha 4 is definitely one you should look at. It fits the bill for a lot of applications and businesses that don't have the time or money to invest in a full MIS development team.

DATAFLEX 3.03 FOR OS/2

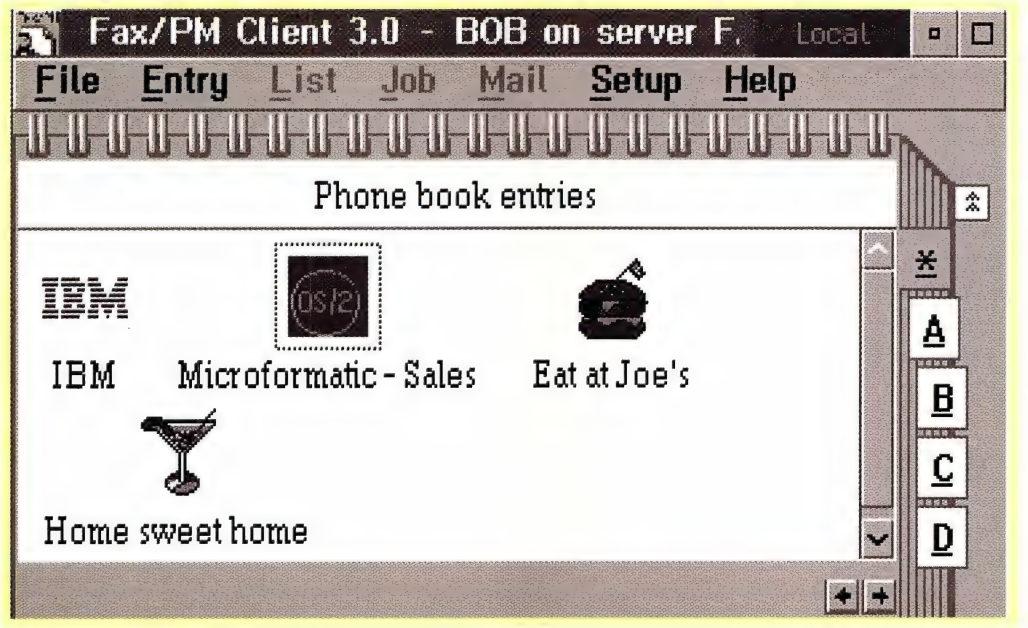
Data Access Corp.

Everywhere you turn these days, you seem to hear the phrase Object-Oriented Programming and Development (OOPD). What does this term really mean? Are any object-oriented database systems available? Since this article is not the proper forum to fully discuss object-oriented concepts and their benefits, I'll leave you with this: in object-oriented programming, objects are programmed once and then reused. It is considerably more complex than it sounds, but that description will have to suffice for now.

The second half of the question is a little more difficult to answer. Several languages are object oriented, but only one database system claims to be so. That program is DataFlex, and the object-oriented aspect is just one side of this DBMS. DataFlex has many other features that developers will like, including cross-platform support and ease of development.

Features

While DataFlex is a character-based system, it has the look and feel of a GUI-oriented program. It has Radio buttons, Check boxes, Pushbuttons and scrollbars, as you would expect



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from a graphically based program, but all objects are created by straight ASCII characters. The menu system is a cross between CUA-style pull-down menus and old style DOS popup menus that appear in the middle of the screen. You can have either type or both if you so desire.

DataFlex does not have any sort of comprehensive data dictionary and all field and entry validations must be done while developing data entry screens. However, once you add a field to a screen, you have a lot of control over what you can do with that field.

DataFlex has a fairly decent report-writing module that is easy to use, though you won't find any QBE (Query by Example) features. It does, however, have a QBF (Query By Form) that you can use to find records for editing.

You can use either of two methods to create applications; you can hand code them or you can use the applications generator. The applications generator will create code in one of two styles; you have a choice of either standard procedural code or object-oriented code. If you start with procedural, you can always change to object-oriented design later. However, if you start coding in object-oriented style, you can't change back to procedural.

Performance

DataFlex is hampered by having very limited import and export facilities. It is only able to transfer data to and from ASCII files. While almost all programs can communicate in this mode, users with hundreds of thousands of records in legacy data could find this detail quite limiting.

To import a file, you must first create a program to import it. Creation is fairly easy if you use the Read utility. This prompt-driven system allows you to specify what fields go into what database fields. The import program must then be compiled and run. The actual import is a little slow, but it works. Here is where the benefits of OS/2 come into play. You can perform other operations while the import is being done.

Once you have records in the system, you will find that you have to create at least one index before you can locate any records. This series of steps can be confusing because you have to go through several menus and subsidiary programs to create indexes. Once the indexes are in place, you can use the records. Finding records based on an index is fairly quick, but searching unindexed fields can take quite a bit more time.

Creating applications can be an interesting experience. Since DataFlex is object oriented, every screen, field, menu, and popup is treated as an object. As an object, other objects can be based on it and inherit its characteristics and properties.

If you need a database that can run on OS/2 as well as DOS, Windows, and UNIX, then DataFlex deserves a thorough look. It is very powerful and has a lot to offer. It is the only object-oriented DBMS available for any of the common operating systems. It also has a very powerful language and the tools to use it.

A couple of things that may cause you to shy away from this product. For one thing, the import and export features are extremely limited, and the tools are not really covered in the documentation. However, if you take the time to learn and master DataFlex, you will not be disappointed with the results.

IBM DB2/2
IBM Corp.

IBM's entry into the OS/2 database market is DB2/2, a version of their popular and powerful database manager for the mainframe. The first thing that you will notice about DB2/2 is that it is primarily a graphical DBMS. Unlike the other entries in this review, you will never have to leave the WorkPlace Shell (WPS) to use it. The most you will have to do is open up an OS/2 prompt window to issue SQL and other programming commands. IBM's DB2/2 is also a very stable database management system (DBMS) for OS/2.

At this point, DB2/2 does not yet fully qualify as an OS/2 implementation of the mainframe product DB2. In later releases, however, the two products will become more and more alike. IBM wants to make the Data Manipulation Language (DML) of DB2 and DB2/2 identical.

DB2/2 comes with a wide assortment of tools for you to use in creating and managing databases. It has tools to let you create databases and tables, data entry screens, reports, and menus. Some of these tools are hard to find and confusing to work with at first. Many of the operations can also be performed at a command line if they are phrased as Structured Query Language (SQL) statements.

The program is broken into three main components: the User Profile management system, the Query Manager, and the Command Line. The User Profile management system is what you use to create user IDs and passwords and otherwise limit access to your databases. It offers quite a bit of security, and to use a database you must first login to it.

The Query Manager is where you will probably spend most of

your time. In my opinion, the QM is somewhat misnamed—you can do much more than just manage your queries and reports from it. The QM is really the command center for DB2/2. From it, you can create databases and tables, data entry screens, queries, reports, and programs.

The Command Line is an OS/2 command prompt with several parameters thrown in. It appears as a Windowed OS/2 prompt and is where you make most of your SQL queries and commands. The package offers a few other utilities, but they are designed for use in a server environment and to help you maintain and monitor multiple databases.

Performance

DB2/2's biggest strength is its ability to connect seamlessly to IBM mainframes. While other vendors use gateways to connect, IBM employs a different technology; its DDCS/2 (Distributed Database Connection Service) software is based on IBM's DRDA (Distributed Relational Data Architecture) standard. Unlike gateway software, which must run on both the client and host machines, DDCS/2 runs only on the client, making it significantly less expensive.

DB2/2's LAN support is less advanced than its mainframe connectivity, however. It supports the NetBIOS protocol only. Surprisingly, it offers no support for Named Pipes. One factor that may contribute to DB2/2's sluggish performance is its use of NetBIOS, which is a relatively slow protocol. NetBIOS is also difficult to route through WANs.

While the conversion to 32-bit code has made DB2/2 faster than the 16-bit DB Manager, its performance is still only fair to middling compared with the other products in this review. DB2/2's score on our Ad Hoc Query test was good, but it came in close to the bottom on the Random Read, Random Write, and Mixed Workload tests.

Database architecture

The most severe limitation of DB2/2 is that all database tables must be contained on one physical hard disk (though the transaction log can be stored on a separate device). If a database grows beyond the size of your disk, you cannot simply add an additional hard disk; you must replace it with a larger one.

Whenever you combine SQL with a 3GL such as C, a bind must be performed that determines the access path used. Most SQL databases perform the binding on the fly in case the table structure or indexes have changed. With DB2/2, the bind process must be run as a separate step. While prebinding makes the embedded SQL appear to run faster, having to rebind explicitly after a structural change is an inconvenience for the administrator.

If you're using OS/2, DB2/2's Applications Remote Interface (ARI) lets you store compiled 3GL code written in C, COBOL, or FORTRAN. You can also store REXX procedures on the server, and a precompiler for embedded SQL is available for all of these languages. The ability to access OS/2 DLLs lets developers enhance the core functionality of DB2/2 if they're willing to do some programming.

DB2/2 supports a smattering of advanced features. Cost-based and rule-based optimization are provided. The cost-based optimizer stores a wide array of statistics, though it does not store a histogram of the data in the manner of Ingres Server and Sybase SQL Server. DB2/2 has no built-in auditing feature. Like DB Manager, DB2/2 supports declarative referential integrity, but offers no support for triggers, which are useful for enforcing business rules or as an alternative method for maintaining audit trails. On-line backup is not currently supported, but is planned for the next release.

DB2/2's greatest strength is its ability to connect transparently with IBM databases on other platforms, especially mainframes. Although it is not a fast performer, it is one of the least expensive of the SQL databases, so it offers a good price/performance ratio. If you're not running LAN Server and OS/2, or if your database is growing rapidly, you should not choose DB2/2. It is best suited for IBM shops with a need to connect to mainframe databases.

DB2/2 is a large-scale client-server RDBMS. It is primarily for downsizing from mainframes to network systems. While you can purchase it as a stand-alone system, it isn't designed to compete with the likes of DataEase, or R:BASE. Its tools, while solid, are no great shakes. The performance with the sample data was good but not astronomical. If you need to share data with mainframes or you want DB2 for the PC, this product may be for you.

DATAEASE FOR OS/2 4.53

DataEase International

Most databases can be broken up into two categories; Programmable and nonprogrammable. DataEase, 4.53, falls into a gray area in between the two. It is a menu-driven system that can lead even the most novice database user through the sometimes daunting task of database development.

By using the menus, you can accomplish virtually every cre-

ation and administration task. This makes DataEase perfect if you need to get a database system up and running quickly. For the more experienced developers, custom-defined-functions (CDFs) can be programmed in C, Assembler, or another supported language. CDFs are useful in extending the features of the DataEase development environment.

DataEase comes with the usual assortment of database tools: a report generator, QBE capabilities, and the DataEase Query Language (DQL) for application development. DataEase SQL Connect lets you develop applications that access data stored in SQL Server, Oracle Server, and IBM's OS/2 EE Database Manager and DB2. Different versions of SQL Connect are available for each server you need.

Due to its menu-driven, tour-guide-like interface, application development in DataEase is very easy. DataEase has field-dependent menus that get displayed across the top of the screen, and a status line across the bottom that indicates the current assignment of the function keys. The mouse gives you point-and-click access to menu choices as well as function-key commands.

DataEase also uses dialog boxes to lead you through the more complex development procedures. For example, when creating links among different tables, a Relationship dialog box appears with prompts asking you for the table and field names to be joined. These features make it very easy to create multi-table forms and applications with DataEase.

The DataEase Query Language (DQL) is not a programming language but is useful for creating complex reports that are beyond the capabilities of the Quick Reports report generator. DQL has 150 available functions and operators and is menu-driven. DataEase guides you through building the code, one step at a time. All options are displayed along the top of the screen, when you select the number preceding the suggested option, the operator is added to the procedure.

Performance

DataEase is a bit slow on the performance side. It imported the records in a couple of minutes, but spent over three hours creating three indexes. Before you import, you must have a database and form defined. You then have to import all of the fields or just the ones that are on the form that have matching names in both files. You have no options to import only selected fields. Nor is there any provision for importing only selected records.

Viewing data is easy. While in a data entry form, you can instantly see a Browse list of the database you've created by pressing <Shift +F1>. If you press <Shift+F1> again, it will take you back to the form view.

Fields are created while you create forms. It is not possible to create a form after creating a database table. A form must appear on at least one screen to create a field. Luckily, it is easy to create a field; dialog boxes let you select field types, lookups for default values, and ranges. You create indexes at the same time, which means that you don't need to switch to an index-creation routine.

DataEase has a form of Query by Example (QBE). QBE makes it simple to query one or more tables. The Quick Reports menu steps through each of the basic QBE elements, including the record criteria, sort order, report format, and output. You can use predefined templates, the default columnar format, or you can have reports that are based on your data-entry screens. Developers can use DQL at any time during the reporting process to define more complex record-selection criteria. Querying on indexed fields was quick and no noticeable delay was evident in retrieving records from our test database. Unindexed queries took more time but no longer than the same query under Alpha 4.

One feature that is unique to DataEase is the addition of security. Each database must have a user and a password. Security can be applied at the database level as well as the field level. You can choose from seven security levels. You can easily define passwords, default-screen attributes, and start-up menus.

DataEase is an easy-to-use tool with enough power for most tasks. Its menu-driven interface makes it especially accessible to less experienced users. If rapid applications development is a prime consideration, and you are not too concerned with application speed, then DataEase is a good choice.

R:BASE 4.5 PLUS

Microrim

In the world of OS/2, precious few database vendors have been around since the beginning and know about the operating system. Even fewer have also been in the DOS database world from the beginning. Microrim of Redmond, Wash. is one such company. For years, they have been producing one of the few databases that runs on DOS and OS/2. They have just shipped a new version of their flagship DBMS R:BASE. Version 4.5 plus adds over 45 new features and

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programming commands that make it even easier and faster to manage your data.

R:BASE has support for the ANSI 89 level 2 SQL built into the database engine. The engine also supports limited referential integrity by enforcing both primary and foreign keys at the engine level. However, the product offers no support for cascading updates and deletions. While not a serious flaw, it is something that needs to be worked on.

The database engine supports several different datatypes, including autonumbered columns, text up to 1,500 characters, date and time, a new combined date/time format, currency, three other numeric datatypes, and a note type for those who need a lot of text. Note fields can be up to 4k in length.

You can create tables using one of two methods; either from the R:BASE command line issuing a create-table command via SQL or the easy way, using the database-creation tools. This section of the program allows you to create, delete, and modify various database components. Anything from tables, indexes, data-entry rules and data-integrity constraints, as well as both foreign and primary keys, are operated on here. Since all data-integrity rules are stored at the engine level, few errors will be introduced into your data.

R:BASE offers a robust programming language that can be used to build applications. The applications generator that is built into R:BASE is one of the best and quickest available for automatically creating programs for you. The applications generator will create all or parts of your application and, by using the interactive debugger, you can ensure that no bugs exist in your programs.

Performance

R:BASE is one of the fastest databases in the DOS world and retains that quickness under OS/2. Locating records in a table with more than 30,000 records via indexes was almost instantaneous and, without indexes, it took only a few seconds more. It took under seven minutes to create two indexes on that same file and importing those records from a *.dbf* file took about five minutes.

R:BASE is quick—but queries and indexing are only a portion of the performance question. R:BASE also has speed in the applications development area. Once you create your tables and other database objects, such as forms, reports and queries, tying them together in an application is also an issue. R:BASE handles this job as well as it does everything else.

Creating applications

The applications generator and programming language will allow you to create and tie everything together in a simple and efficient manner. You can have R:BASE create a full system for you based on the definition of a single table.

You have to create the menus, reports, forms and queries, and then have R:BASE create an application for you. Menu choices can have more than one action, and forms can have field-level popup menus and other validations as you see fit. Reports can be sent to the monitor, printer, or both. The report writer is band oriented and you can lay out your fields in any format that you want. On both forms and reports you can move your fields and text by clicking and dragging the mouse. By pressing the right mouse button, you can bring up a screen that allows you to define field-level help, colors, and other options.

The programming language is easy to follow even for a novice developer, and you can pretty much do anything in an application that you want to. It also includes a very good interactive debugger.

Nobody's perfect

R:BASE is not flawless; like any program, it has its good and bad points. We've looked at the good ones, now let's see what problems you may encounter. Fortunately, few exist, and many of them may be based on my own personal opinion.

For starters, the program displays a marked lack of connectivity to other file formats. R:BASE uses a proprietary database format and is limited to that format and connection to *.dbf* files. It offers no support for moveable/resizeable windows, which is not necessarily a drawback. Most users will be able to live without the ability to open another data entry form from an already open one.

Another problem that I see is R:BASE's lack of support for cascading updates and deletes. Since R:BASE has support for both primary and foreign keys, it seems logical that they would take this ability to the next level.

If you need a fast, flexible DBMS and can live with the lack of connectivity and proprietary database format, then R:BASE is a program that you should look at. It has a lot going for it, including a history of solid growth and updates.

Final thoughts

While PC databases have been around since the dawn of DOS, OS/2 databases are a relative newcomer to the PC. Of the five we looked at, only one stands alone as both a GUI-based system and an

OS/2 database with no DOS relatives. Each program had its strengths and weaknesses, and your final choice should be based more on whether the program will get the job done for you rather than based on its features.

All of the products we looked at had equivalent features and capabilities. The interfaces of all were very different but equally easy to get used to. In all cases but that of DB2/2 , if you need to share data across DOS and OS/2 equivalent versions of each product are available on both platforms.

If you need access to data in *.dbf* formats and must share the data with other users or otherwise can't import it, you have two choices: Alpha 4 and R:BASE 4.5 plus. Alpha 4 is more of an end-user tool and, while easy to work with, it limits you in terms of connectivity and programmability. It offers no facilities to use data in any form other than *.dbf*. It does not support SQL or provide a programming language.

R:BASE, on the other hand, has a wonderful programming language and can use *.dbf* files in their native format as well as in its own proprietary database format. It too is lacking in connectivity options. It offers useful development tools, but you may want a more modern windowed interface. One thing R:BASE had over all the others is speed. It was the fastest at importing and indexing. Alpha 4 came close in indexing speed, and had no need to import the test data.

DataFlex may be the ticket for you if you want to get into object-oriented development. It has a very clean interface but suffers from slow performance. It is also the most language-based program. Learning the language is a bit slow, but will reward you with a lot of flexibility in the DataFlex environment. DataFlex is another program that suffers from lack of connectivity. It can only import and export from ASCII, and offers no support for SQL or server-based data.

DataEase is a nice all-around package. It is very quick to develop in, connects to SQL servers and other data through the use of a separate SQL-connect package, and has a very rich feature set. Unfortunately, it suffers from lackadaisical performance. It was the slowest at importing and indexing our test data. Query performance was not too bad, but could have been better. It has the added benefit of being only one of two systems that include built-in security.

The other program with security was DB2/2. This product is more than just an applications development tool. It is really more of a back-end database. While it has the necessary tools, creating applications is really not its prime function. It is really intended to be used for large-scale downsizing client-server systems. A few third-party tools are available to create front-end systems to DB2/2 that are both more powerful and easier to use than the ones that come bundled with it. It suffers mainly from poor import and export features.

Craig M. Bobchin is the founder and president of CMB Systems Design, a microcomputer consulting firm located in Orange County Calif. CMB Systems Design specializes in applications development using a variety of database products.

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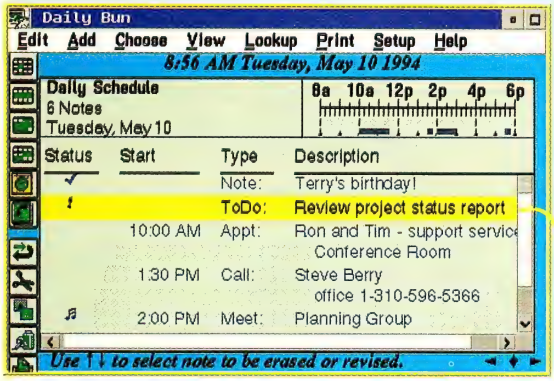

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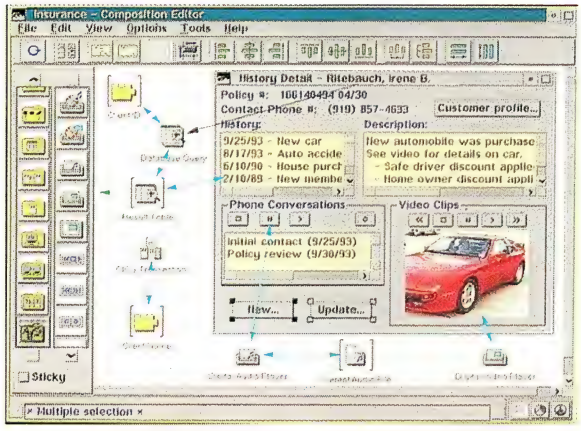
IBM announces the beginning of Visual Age



IBM announced the release of their Smalltalk-based client/ server visual application builder, Visual Age. This package allows front ends to databases to be created via drag and drop from pre-built or customized reusable parts. The base package includes support for DB2/2 and DDCS, with additional modules available to connect to non-IBM databases.

The price for the base package is $2,495 and a team version which includes version control is $4,995. Call IBM at (800) 426-2279 or (919) 469-6000, or fax (919) 469-7423.

READER SERVICE NO. 159

QwikSwitch 1.2c

Start your programs by keyboard or key word

QwikSwitch 1.2c ($39.95) from Bitware Consulting is a utility that assigns hot keys to applications and objects. This 32-bit utility allows OS/2 events to be started using the keyboard or a microphone (via an interface to IBM's ICSS). The GUI configuration interface supports drag-and-drop to launch and switch between any OS/2, DOS, or Win-OS/2 session or Desktop Folder. Other features include starting DOS and Windows programs using specific session settings and initiation of an OS/2 shutdown or lockup from any session. Contact Bitware at (604) 525-5959 or (800) 663-8066, or CompuServe 72303,412.

READER SERVICE NO. 160

Desktop Observatory 3

Customize every desktop on the LAN

Pinnacle Technology released the third version of their LAN Management software, Desktop Observatory ($179). This program helps administrate and customize OS/2 desktops, both locally and across a LAN. The customization features give it the ability to set access to objects, restrict object-modification, and schedule activities as objects are accessed. Security features include password protection for workstations.

Desktop Observatory requires OS/2 2.1 or greater and works with any OS/2 compatible LAN. Contact Pinnacle Technologies at (800) 525-1650 or (317) 279-5157, or fax (317) 279-5157.

READER SERVICE NO. 161

Tritus SPF 1.2.6

Mainframe text editing on OS/2

Tritus Inc. announced Tritus SPF 1.2.6 ($99), a text editor similar to IBM's mainframe-based ISPF/PDF 3.3. This program features unlimited Undo/Redo, complete keyboard mapping, source-code comment highlighting, large file capacity, a maximum record length of 64,000, and multiple cut/paste queues.

Tritus SPF 1.2.6 includes both OS/2 and DOS versions. Call Tritus at (800) 321-2100 or (512) 794-5800.

READER SERVICE NO. 162

Sytos Scheduler 1.0

Make your system run like clockwork

Sytron Corp. announced the release of Sytos Scheduler ($99), an OS/2 scheduling utility. Sytos Scheduler allows events to be set at daily, weekly, or monthly intervals using a point-and-click interface. Scheduling exceptions include one-time-only events and exceptions for special dates, such as holidays. Contact Sytron at (508) 898-0100, or fax (508) 898-2677.

READER SERVICE NO. 163

Using OS/2 2.x, 3rd Edition,

A new book on the joy of 2.x

Que Publishing announced a special version of the 3rd edition of its *Using OS/2* ($29.95). This volume contains a wide range of information for the beginning, intermediate, or advanced power users. It includes expanded networking

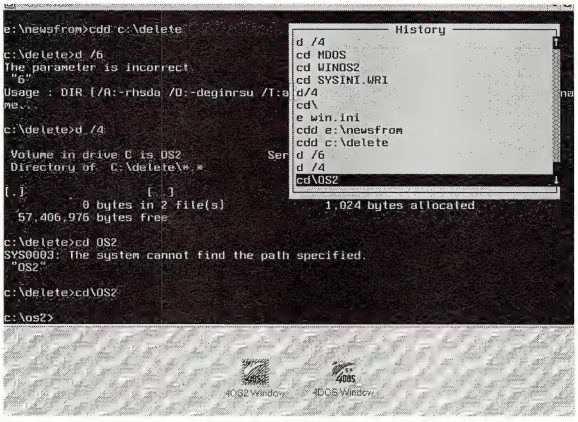
Just Announced

Late-Breaking Developments in the World of OS/2

4OS2 2.0

Better commands for the command line

JP Software announced a new version of the replacement command processor, 4OS2 ($69). 4OS2 is a utility that replaces OS/2's basic command processor (*cmd.exe*), and offers new commands from a standard OS/2 prompt. New features in this release include a directory history window, more precise file viewing/selection options, better batch programming tools and a feature set compatible with 4DOS 5.0. 4OS2 2.0 comes in both 16-bit and 32-bit versions. Contact JP Software at (617) 646-3975 or fax (617) 646-0904.



READER SERVICE NO. 164

information and more details about OS/2 procedures. Call (800) 428-5331 or (317) 581-3500.

READER SERVICE NO. 165

Print Utility/2 1.2

Capture screens and print better

Talor Made Systems released a set of programs packaged as Print Utility/2 ($59). These three Workplace Shell utilities include File Lister/2, PrtScr, and PSShow.

File Lister/2 is a printing utility that reads either ASCII text or binary files, and prints them with options such as pagination, page numbers, and selective printing. The other two utilities, PrtScr and PSShow, work with each other as screen capture and screen-capture display respectively. Call Talor Made Systems at (205) 344-0672.

READER SERVICE NO. 166

J&J Utilities 1.0

Take command from the command line

J&J software announced the release of J&J Utilities 1.0 ($25), a package of 12 OS/2 command-line programs for system maintenance. These programs include a utility for specifying the priority of executables, a FAT/ HPFS disk-defragmentation utility, and a variety of file-management utilities. DOS versions of eight of the utilities are included in the package. Call J&J software (405) 624-1472, or fax (405) 743-2613.

READER SERVICE NO. 167

SpaceMap 1.1

Manage files and disk space across a LAN

Capstone Software Inc. released an update to their file-management utility, Space Map ($59.95). This 32-bit Workplace Shell utility helps manage disk space by displaying the size of directory trees and providing file search/management/archival features. Additional features include graphic display of file-data and extensive use of multi-threading. Call Capstone Software at (800) 500-2244 or (317) 848-2414, or fax (317) 848-2451.

READER SERVICE NO. 168

System Notebook 1.3

Kiss your text editor goodbye!

VacNat Software announced System Notebook 1.3 ($20), a notebook front end for OS/2's *config.sys* and *autoexec.bat* files. With this utility, system settings, such as time slicing, program, DLL, help, bookshelf, and data paths, swapfile settings, FAT/HPFS cache settings, command-line prompt settings, and DOS settings can be set from a tab on a WPS notebook. New features include an Optimize function that queries the system for RAM size, among other things, and sets various parameters in the startup files for optimum performance. Contact VacNat Software at (816)887-2928 or CompuServe at 70572,1247.

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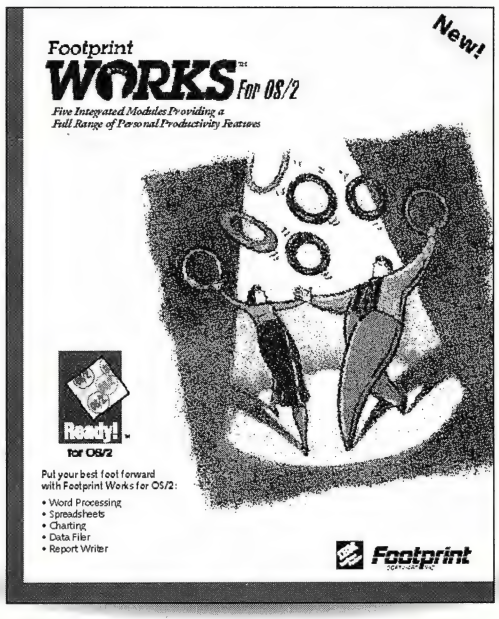

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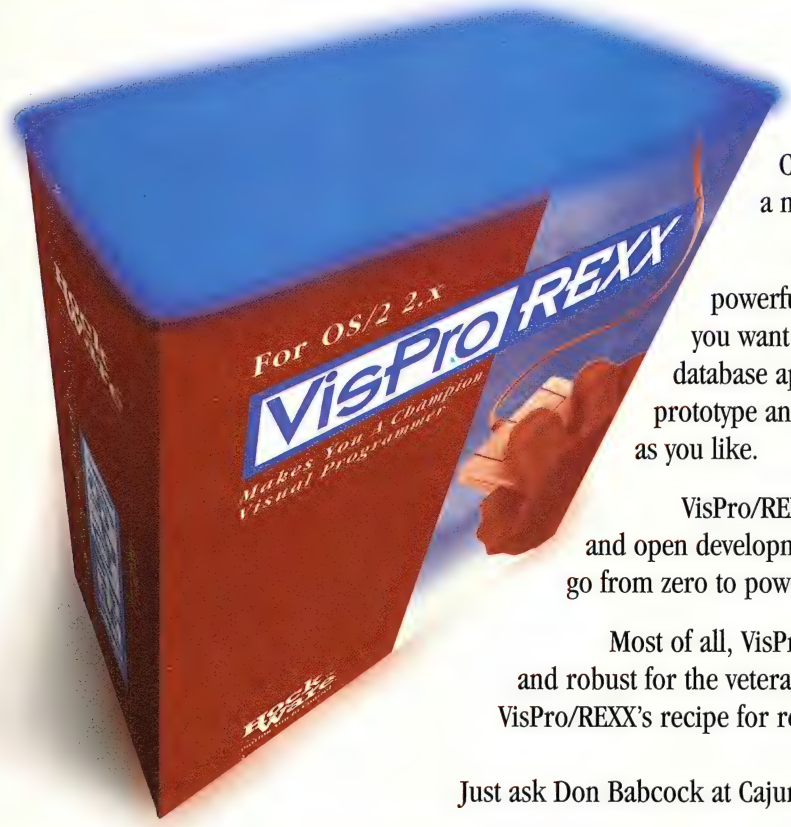

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Recursion, see: recursion

IN CASE OF DOUBT, CALL YOURSELF

BY ALEX LANE

This month's title reflects a whimsical view of recursion, which occurs when things consist partially or are defined in terms of themselves. In programming languages, recursion commonly refers to functions that execute by calling themselves. But, before we delve too deeply into this subject, let's quickly review what we know about functions in REXX.

In the March issue ("Programming with Functions," pp. 67-69), we introduced the idea of functions, which allow you to package code that performs a particular task. REXX offers a number of built-in functions and you can write your own as well. Generally, in REXX, variable names inside functions refer to an essentially "new" and different set of variables from those used in any other procedure or in the main part of your program.

For example, look at the code in Listing 1. This code shows one way to write a function that calculates the factorial of an integer. Recall that, by definition, zero factorial (written **0!**) is one, while the factorial of any other positive integer **n** is **n * (n-1) * (n-2) * ... * 1**, so that, for example, **5!** is **5 * 4 * 3 * 2 * 1** or 120, **3!** is **3 * 2 * 1** or six, and **1!** is simply one.

You'll notice we have a variable named **J** in the main part of the program (the part before the **exit** instruction), and another variable named **J** inside the **factorial** function. At the start of execution, before the call to **factorial** is made, the value of **J** is eight and the variable **J** inside of **factorial** doesn't actually exist. When REXX starts to execute the code for the **factorial** function, the variable **J**, whose value is eight in the main program, is effectively put in limbo. It will stay there until the **factorial** function returns a value to the main program. When that happens, the **J** that existed inside the **factorial** function essentially disappears, and the original **J** is restored.

Now, take a look at an alternative way of coding the **factorial** function shown in Listing 2, which takes advantage of the fact that, for example, **5!** is **5 * 4!** (in other words, to find the factorial of an integer, find the factorial of the integer minus one and multiply by the integer itself).

When the function in Listing 2 executes say, using an initial value **N=3**, the input parameter is neither zero nor one, the **factorial** function calls itself with a value of **N** minus one, or two. Now, the current "copy" of **factorial** is put in limbo, and a "new" copy starts to execute with an initial value, **N**, of two. This **N** has nothing to do with

Listing 1: Fact1.cmd

```
/* FACT1.CMD */
j = 8
say j'! =' factorial(j)
exit

factorial : procedure
  arg n  /* parse the input parameter */
  select;
    when n = 0 then
      return 1
    when n = 1 then
      return 1
    otherwise
      j = 2
      do k = 3 to n
        j = j * k
      end /* do */
      return j
  end /* select */
```

the value of **N** in the earlier call to **factorial**.

In this second copy of **factorial**, **N** is neither zero nor one, so yet another call to **factorial** is made; this time, with a value of one. As before, the second copy of the function is put in limbo, while a third, new copy begins to execute. This time, **N** (which is different from any of the other **N** variables) is one, causing the third copy to return a value of one. The third copy of **factorial** is thus retired, and the second copy is restored.

The value returned, one, is now multiplied by the value of **N** in the restored second copy of **factorial** (in this case, two) and the result is returned from the second copy, which retires the second copy, restoring the original first copy of **factorial**.

The value, two, returned by the second copy is multiplied by the value of **N** in the original **factorial** (in this case, three) and the result is returned to the main program. This type of function, which calls itself repeatedly with slightly different parameters each time, is called recursive.

If all of this sounds confusing, don't despair. Very few people I've met have ever comprehended recursion the first time around. To help show what's going on, remove the comments from around the **trace** instruction and run the program. The output (with **trace** enabled) is shown in Listing 3. (**trace**, by the way, is a built-in REXX function that controls tracing of program execution. You can learn more about it in the file *rexx.inf* that's installed along with REXX.)

The general format of the output is the line number being executed, followed by three characters that identify the type of trace output being displayed, followed by appropriate data. A *-* identifies actual lines of the program and is followed by all or part of a line of code. **A >>>** identifies the result of an expression evaluation, the parsed value of a variable, or a value returned from a function.

In Listing 3, **factorial** is first executed in lines 10 and 11; the parsed argument **N** is assigned a value of three. Evaluating the expressions in lines 13 and 15 obtains zero (or false), so execution goes on to line 18, where **factorial** is called again.

Now, execution is back at line 10, at the start of the **factorial** function. The indentation reflects the fact that this call is recursive. Now, the value of the argument is two. Lines 13 and 15 obtain zero again, and **factorial** is called a third time, with an argument of one. This time, the expression in line 15 evaluates to one (or true), and the value "**1**" is returned, cascading into return values of "**2**" and "**6**." Finally, the string to be output by the **say** function is composed and output.

If you play with increasingly larger values for **J**, as shown in Listing 2, you'll eventually find that REXX will issue an error message to the effect that the control stack is full. This control stack is the limbo in which the calling environment is stored when a function call is made. On most machines, the limit for **J** in the recursive form of **factorial** in Listing 2 is well short of 100. In the non-recursive form in Listing 1, you can calculate the factorial for values much larger than 100. (My OS/2 PC calculated 365!—a number 779 digits in length—in just under five seconds.)

Once you understand recursive functions, you'll be tempted to use recursion everywhere! However, as we've shown in the case of the factorial function, we can do just as good a job (if not better) of implementing the function by using an iterative rather than recursive approach. Does this mean you should never use recursion? No, just that you should use care in coding recursive functions.

Alex Lane is a consultant and writer, and a contributing editor to OS/2 Magazine, Software Development, *and* AI Expert. *He can be reached at CompuServe 75715,1370, or Internet as alex.lane@springsboard.org.*

Listing 2: Playing with increasingly larger values.

```
/* FACT2.CMD */

j = 3

/* trace R */
say j'! =' factorial(j)

exit

factorial : procedure
  arg n  /* parse the input parameter */
  select;
    when n = 0 then
      return 1
    when n = 1 then
      return 1
    otherwise
      return n * factorial(n-1)
  end /* select */
```

Listing 3: Output with Trace enabled

```
 6 *-*   Say j'! =' factorial(j);
10 *-*    factorial:
10 *-*    Procedure;
11 *-*    Arg n;
   >>>     "3"
12 *-*    Select;
13 *-*     When n = 0;
   >>>      "0"
15 *-*     When n = 1;
   >>>      "0"
17 *-*     Otherwise;
18 *-*       Return n * factorial(n-1);
10 *-*         factorial:
10 *-*         Procedure;
11 *-*         Arg n;
   >>>          "2"
12 *-*         Select;
13 *-*           When n = 0;
   >>>            "0"
15 *-*           When n = 1;
   >>>            "0"
17 *-*           Otherwise;
18 *-*             Return n * factorial(n-1);
10 *-*               factorial:
10 *-*               Procedure;
11 *-*               Arg n;
   >>>                "1"
12 *-*               Select;
13 *-*                 When n = 0;
   >>>                  "0"
15 *-*                 When n = 1;
   >>>                  "1"
15 *-*                 Then;
16 *-*                   Return 1;
   >>>                    "1"
   >>>                "2"
   >>>            "6"
   >>>       "3! = 6"
3! = 6
 8 *-*   Exit;
```


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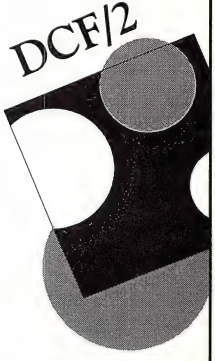

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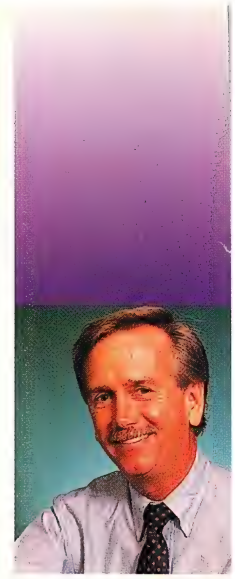

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THIS MONTH, WE LOOK AT THE WORLD OF OS/2 CD-ROMS BY DICK CONKLIN

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CD-ROMs are a very high-density (over 650MB) digital storage medium, using the same 4¾-inch compact discs that have taken over the audio entertainment market. They are inexpensive to produce (approximately one dollar in large quantities), durable, and immune to the magnetic fields that damage ordinary computer disks. Their only disadvantage is that they are read-only. (With a special CD-ROM recorder you can create your own discs, but they can't be erased or reused.)

Room to Grow

The huge storage capacity of CD-ROMs makes them perfect for many OS/2 applications. OS/2 itself can be purchased on CD-ROM for slightly less than the multiple-disk version. Volumes of on-line information—over 200,000 pages of text—can fit on one disc. Software search and retrieval engines, such as OS/2's **view** command, simplify the navigation through reams of manuals.

Catalogs, shareware, databases, fonts, developer's toolkits—any application requiring hundreds of megabytes of on-line storage is a candidate for CD-ROM. Multimedia is a perfect example; storage-hungry graphics (still and animated), video (still and full-motion), and audio files need the space that CD-ROMs offer. Compression/decompression software further expands the discs' capacity.

Try and buy

Some hot new applications seem to be made especially for CD-ROM. Complete applications (several of them) can be distributed on a single CD-ROM demonstration disc. You can try out an application in demonstration or restricted mode to see if you like it. If you decide to purchase the full-function version, there's no need to order and wait—just call the vendor and provide a credit-card number; you'll get a code that unlocks the application so you can start using it right away. The vendor captures your name and address to send you hardcopy documentation and future upgrade offers.

IBM's Software Manufacturing Division in Boulder, Colo. offers a software distribution and marketing program called CD Showcase. SMD has over 100 popular OS/2 applications in its database and many for Windows and DOS. Customized disks are developed for resellers, tailored to their own specific markets. For example, a reseller targeting the home market could offer a CD featuring a selection of educational and game software. Corporate customers are also beginning to use CD-ROMs to distribute software to their internal users. (For more information on CD Showcase, call (800) 926-0364.)

An expert on disk

Another new application area fueled by CD-ROMs is the expert system (see "Hot off the press," *OS/2 Magazine*, Premiere 1993, pp. 11-16). Let's say you are having trouble getting a new fax-modem to work, by asking a few questions and narrowing down the available solutions, an expert system can often provide an instant fix to a known problem, including a software patch, procedural change, or device-driver. IBM's Technical Connection CD-ROM is described in Table 1.

Device drivers

If you are planning to add a CD-ROM drive to your system, you'd better check with the manufacturer first to make sure an OS/2 device driver is available. Table 1 gives two sources of OS/2 CD-ROM drivers.

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Table 1.
OS/2 CD-ROM DIRECTORY

PRODUCT	COMPANY / INFO	DESCRIPTION
OS/2 2.1	IBM Corp. Tel: (800) 342-6672 Can: (800) 465-7999	OS/2 is available on CD-ROM: Full version, for Windows, or upgrade from OS/2 2.0: $199 new, $125 for the upgrade.
OS/2 2.1 ServicePak	IBM Corp. Tel: (800) 342-6672 Can: (800) 465-7999	The March 1994 update to OS/2 2.1: $25.
OS/2 On-line Book Collection	IBM Corp. Tel: (800) 342-6672 Can: (800) 465-7999	Over 100 IBM OS/2 product manuals with search and retrieval software: $49.
Technical Connection Personal Software	IBM Corp. Tel: (800) 992-4777	Expert system for OS/2 users, help desk personnel, and developers includes: technical information, support, answers, fixes, updates, bulletins, and tips & techniques. Includes OS/2 On-line Book Collection. $59 for a single copy, $119 for quarterly subscription, and $299 for monthly subscription.
Hobbes OS/2 CD-ROM	Walnut Creek CD-ROM Tel: (800) 786-9907 (510) 674-0783 Fax: (510) 674-0821 *orders@cdrom.com*	2,800 files from Internet's *ftp-os2.cdrom.com* archive; shareware and freeware applications, utilities, device drivers, bitmaps, compilers, games, and more: 600MB+: $29.95.
OS/2 Box	Damar Enterprises Can be ordered from CD-ROM Access Tel: (800) 959-5260 (415) 941-2400 Fax: (415) 941-4900	Over 300MB of 1993 OS/2 shareware. Includes a graphical user-interface front end: $25.
OS/2 Applications Directory	Miller Freeman Inc. Tel: (415) 905-2728 Fax: (415) 905-2239	Vendors and applications serving the OS/2 market. Special offer: hardcopy version with CD-ROM: $9.95.
The Selectware System	SelectWare Technology Tel: (800) 342-3366 (810) 477-7340	Guide to OS/2 applications, company and product profiles and demonstrations: $9.95 (one issue) introduction $49.95 for a four-issue subscription.
CD Studio	Young Minds Inc. Tel: (909) 335-1350 Fax: (909) 798-0488	
CorelDRAW! 2.5	Corel Corp. Tel: (800) 836-3729 (800) 772-6735 (613) 728-3733 Fax: (613) 728-9790	
MEDIAscript OS/2: Publisher Edition Desktop Edition Professional Edition	Network Technology Corp. Tel: (800) 843-3688 (914) 478-4500 Fax: (914) 478-4507	
Jasmine Multimedia Products	Jasmine Multimedia Publishing Tel: (800) 887-7771 Can: (800) 465-7999 Fax: (800) 887-7772	
SAA ImagePlus/2	IBM Corp Tel: (800) 342-6672 Can: (800) 465-7999 Fax: (313) 225-4020	
DB2 OS/2	IBM Corp. Tel: (800) 342-6672 Can: (800) 465-7999 Fax: (800) 445-2426 Fax: (404) 835-7797	
OS/2 LAN Server 3.0	IBM Corp. Tel: (800) 342-6672 Can: (800) 465-7999 Fax: (404) 238-3442	
OS/2 Device Drivers for CD-ROM drives	IBM and HW Vendors CompuServe: GO OS2SUPPORT BBS: (919) 517-0001	

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DESCRIPTION

CD Studio: CD-ROM production system, creates CD-ROMs on an OS/2 desktop system. Includes MakeDisk premastering software and an intelligent controller for CD-ROM recorders: $18,250.

CorelDRAW! 2.5: Graphics package for drawing, charting, photo-editing; over 14,000 images, 250 fonts: $149.

MEDIAscript OS/2: OS/2 multimedia design tools for creating and publishing CD-ROM multimedia presentations and applications; includes CD-ROM recorder: Call for prices.

Jasmine Multimedia Products: Supports OS/2 DVI video, video, special effects, stills, music—royalty-free: $149 for each of six products.

SAA ImagePlus/2: LAN-based image-processing system; document processing, workflow management, optical device support: $2,890.

DB2 OS/2: Database management for users and applications; DB server, query, administration, and backup: $425 single, $95 upgrade, $2,495 multiple-user.

OS/2 LAN Server 3.0: LAN file server for OS/2 local area networks; supports unattended, remote install, remote IPL, multiple LAN adapters: $716 entry, $2,066 advanced.

OS/2 Device Drivers for CD-ROM drives: Device drivers are software required for OS/2 support of CD-ROM drives.

CD-ROM-based OS/2 Development Tools:

PRODUCT	COMPANY / INFO	DESCRIPTION
The Developer Connection for OS/2	IBM Corp. Tel: (800) 633-8266 Can: (800) 465-7999 (303) 924-9989 Fax: (800) 494-3045	Latest IBM OS/2 tools for developers; quarterly CD-ROMs with newsletter; pre-release software, demonstrations, technical information, sample code; includes CompuServe technical support: $199 for four issues.
Device Driver Source Kit for OS/2	IBM Corp. Tel: (800) 633-8266 Can: (800) 561-5293 (303) 924-9989 Fax: (800) 494-3045	OS/2 device-driver source-code, build and test tools, on-line documentation: $199 for four issues.
IBM Ultimedia Tools	IBM Corp. Tel: (800) 887-7771 Can: (800) 465-7999 Fax: (800) 887-7772	Tools for developing multi-media applications; sampler CD-ROM, Builder/2, Perfect Image/2, Workplace/2, Video IN: $120 - $239.
IBM C Set++	IBM Corp. Tel: (800) 342-6672 Can: (800) 465-7999 (416) 448-4310 Fax: 416-448-6057	C/C++ compiler, browser, class libraries, debugger, trace analyzer, OS/2 Developer's Toolkit, and WorkFrame/2: $339 single, $139 upgrade.
Multimedia Presentation Manager Toolkit/2	IBM Corp. Tel: (800) 342-6672 Can: (800) 465-7999 (407) 443-6588 Fax: (407) 443-6824	Tools for developing OS/2 MMPM/2 applications; comes with OS/2 2.1 Developer's Toolkit, sample programs, on-line documentation: $199.
DAP Library Vol. 1	IBM Corp. Fax: (44) 256-336778	IBM's Developer Assistance Program in Europe / Middle East / Africa (EMEA) offers OS/2 tools and utilities.

Understanding the OS/2 *config.sys* file

BY MARK MINASI

OUR NEW COLUMNIST TELLS US ABOUT HIS *CONFIG.SYS*

Unlike Windows or DOS, OS/2 does not place all of its vital configuration information in just one file. The essential parts of an OS/2 configuration reside in *config.sys* as well as other files, including, *os2.ini*, *os2sys.ini*, *startup.cmd*, and in dozens or hundreds of extended attributes attached to files. But, if you must point to one file that contains most of the foundation information—the system-tuning information, it would be *config.sys*. It's also the most easily modifiable of the configuration files, as it's the only one maintained in simple ASCII.

On your mark, get SET...

A look at a typical *config.sys* shows many commands starting with **set**. **Set** is used heavily in OS/2, but you may already know it from DOS. If you were to type **set** from the command line in DOS (I'll start off with a DOS example, because it's simpler to explain), you might get lines that look like this:

```
PATH=C:\DOS;C:\WP
PROMPT=$p$g
COMSPEC=C:\COMMAND.COM
```

Notice the pattern; a name, an equal sign, and some letters. **Path**, **prompt**, and **comspec** are all environment variable names. An area is set aside in the operating system's RAM for information about the system. **Path**, as you probably know, tells DOS's *command.com* where to find programs. The **prompt** variable tells DOS's *command.com* how to present a command prompt; in this case, *c:\>*. The **comspec** variable tells *command.com* where to find a copy of itself on disk (*command.com* must reload itself from disk to memory periodically during the day).

Config.sys is the most easily modifiable of the configuration files.

These environment variables mean nothing to the operating system as a whole, they only have meaning to a single program—*command.com*, in this example. Environment variables exist for the convenience of particular programs. The values of environment variables can be changed by a program or from the command line with the **set** command.

Let's look at some of the **set** commands that you find in *config.sys*. The first two in my *config.sys* are extremely important:

```
SET USER_INI=C:\OS2\OS2.INI
SET SYSTEM_INI=C:\OS2\OS2SYS.INI
```

The files *os2.ini* and *os2sys.ini* are employed by *pmshell.exe*, which is the Workplace Shell GUI. If these files become damaged, getting OS/2's Workplace Shell to work can be impossible. Here's a quick-and-easy procedure that you can use to back these files up.

A command in OS/2's *config.sys* instructs OS/2 to run a text program—**run=**. I put this line in my *config.sys*:

```
RUN=C:\OS2\XCOPY.EXE
C:\OS2\OLDINI\*.INI
C:\OS2\OLDINI2
RUN=C:\OS2\XCOPY.EXE
C:\OS2\*.INI C:\OS2\OLDINI
```

(Of course, for this statement to work, I must have created a directory called *c:\os2\oldini* and my OS/2 files must be on the *c:* drive. Adjust the drive letters accordingly if you've used Boot Manager to put OS/2 on a drive designated by a different letter and be sure to create *oldini*.) Making this change causes the *.ini* files to be backed up every time I boot and keeps backups of the *.ini* files from the boot before the current one. If I realize that I've damaged my Desktop, I can just roll back to the previous Desktop this way:

- Copy the good *ini* files to *c:\os2* (this step is not necessary, but

it's neater in the long run). Call them *os22.ini* and *os2sys2.ini*, since the system will not allow you to overwrite *os2.ini* and *os2sys.ini*.

- Change the *config.sys* lines so they look like this:

```
SET USER_INI=C:\OS2\OS22.INI
SET SYSTEM_INI=
   C:\OS2\OS2SYS2.INI
```

- Reboot, and you're back in business.

This method is no cure-all for the damaged desktop blues, but it goes a long way. The next **set** in my *config.sys* is **set os2_shell= c:\os2\cmd.exe**, which just points to the OS/2 replacement for *command.com*, *cmd.exe*. *Cmd.exe* is the command-line interpreter that controls the OS/2 Window and OS/2 full-screen objects. As this variable suggests, you could, theoretically, replace *cmd.exe* with another program. The **os2_shell** variable should match the one that comes shortly thereafter—**comspec**.

When in a command-line session, you can recall any previously-entered command by pressing the <Up> arrow.

The next **set** variable is useful when you want to start up OS/2 without starting up any application programs: it looks like this:

```
SET AUTOSTART=PROGRAMS,
   TASKLIST,FOLDERS,CONNECTIONS
```

As you know, OS/2 has a feature that allows you to start up a lot of programs on the Workplace Shell, do a shutdown, and, from then on, OS/2 will start up those programs every time that you boot your system. No editing *autoexec.bat* statements; just shutdown when your calendar program is active, and it'll come up every day automatically. But sometimes, you don't want that to happen. For example, I had a problem with OS/2 2.0 where running Windows caused my video monitor to lose sync. The problem was, rebooting did nothing for me. Every time I rebooted, OS/2 would dutifully start up Windows for me, repeating the video problem. Had I known it at the time, I could have fixed my problem by removing

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the **programs**, from the **autostart** line. Making that change causes OS/2 to start up without automatically starting up the applications that were active when you last performed a shutdown.

The next **set** is **runworkplace=c:\os2\pmshell.exe**, which just points to the Workplace Shell's program, and shouldn't be changed. The **set** statements for **path**, **dpath**, and **prompt** are next. **Path** and **prompt** work exactly as they do in DOS, and **dpath** is like the DOS **append** statement. More specifically, **dpath** is the Data-path command; **dpath** helps D system find D data, you might say.

Next, we have the **set ipf_keys=sbcs** statement. This statement is used by the Help facility in some way, but truthfully, I'm not sure how. The next **set** is **set keys=on**, which instructs OS/2 to keep a command history, like the **DOSkey** command does for DOS. When in a command-line session, you can recall any previously-entered command by pressing the <Up> arrow, unless you set **keys=off**. There's probably no reason to set **keys=off**, however, unless you're doing some kind of keyboard-control programming and the command-history function is getting in your way. Here is a **set** command with a **REM** statement in front of it:

```
REM SET DELDIR=C:\DELETE,512;
```

Putting **REM** in front of any *config.sys* command tells OS/2 to ignore that statement. I strongly recommend that you remove that **REM** statement! OS/2 has an **undelete** command like the one in DOS, but it will not work until you remove the **REM** and reboot. The **set deldir** tells OS/2 to use a directory (*c:\delete* in this case, but you can change that) to save copies of erased files. Then, when you want to undelete a file, OS/2 just retrieves it from the *c:\delete* directory. The **512** means "don't devote more than 512K to keeping old files around." Obvious-ly, you can adjust this number, but do it immediately upon installing OS/2; take the **REM** off the **rem deldir...** statement. Why did IBM make **REM** the default value here? The story I heard is that because the **undelete** command can only be accessed from the command line and not from the Workplace Shell (there's no GUI option and no pop-up menu command from which to undelete), most people would never try to undelete. Then, no space would be taken up on the disk for the **deldir** files.

Mark Minasi has been a consultant and educator in the fields of advanced PC operating platforms and PC technology since 1984. He is a contributing editor for Compute, BYTE, *and* OS/2 Magazine. *You can contact him at CompuServe 71571,264 or Internet mminasi@access.digex.net.*

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Tips & Tricks *cont'd from p. 84*

applications in full-screen mode, all of the applications run in a single address space, much like they do under DOS and Windows. But, this DOS session is a protected Virtual DOS Machine (VDM) running under OS/2. Therefore, if one application goes down, it can take down all of the other Windows programs running in that session.

When running Windows applications in seamless mode, you can choose to run them all in one VDM or each in its own VDM. By running them all in one VDM, you save memory, because only one copy of Windows code (Win-OS/2) needs to be in memory, but you may be sacrificing stability running them in a full-screen Windows session.

You can choose a setting that allows seamless programs to be run in separate sessions. Start by bringing up the settings notebook for the Windows application program. Click with button one on the session page and, if you click on and highlight the Win-OS/2 Window item, the "Separate Session" checkbox is enabled. Clicking on, and checking this checkbox will cause this program, when opened, to be loaded in its own copy of Windows under OS/2 (Win-OS/2). If the box is not checked, this program will load in the same VDM and copy of Win-OS/2 as the others.

The benefit of separate sessions is that if one program encounters problems, it can only take itself down and its copy of Win-OS/2, without affecting any others. The trade-off here is that each VDM and copy of Win-OS/2 uses memory, but if you have the memory, and want the stability, this feature will be beneficial to you.

TOSHIBA CD-ROM

Q: I've got a Toshiba CD-ROM drive and a Mediavision Pro Audio Spectrum-16 card. I connected the CD to the SCSI port of the Pro Audio Spectrum and I've tried using it directly under OS/2 but I can't seem to get it to work.

A: The driver you need is not currently included with OS/2. However, it, like many many drivers can be found on bulletin boards and on-line services, such as CompuServe. To run this particular configuration, you will need to download the SCSI port OS/2 device driver. One place it can be found is in the Mediavision library on CompuServe. The file name is *tmv1scsi.zip*.

Once you obtain the driver file (the *.add* file) you can actually install OS/2 from the CD-ROM drive if you like. Since the driver that needs to access the CD-ROM drive is not on the OS/2 installation disks, you will need to create custom disk number 1. You can create this disk by following these steps:

- Make a backup copy of OS/2 disk number one. You can use the diskcopy command under DOS or a previous version of OS/2.
- Copy the CD-ROM device driver *.add* file to this new disk. You may find that you do not have enough room on the disk for the file. If so, follow this basic rule of thumb to remove files to make room: If you are on a Microchannel bus machine, the device drivers named **01.sys* (all device drivers that have *01.sys* as the last six characters of the file name) are not needed, as they are ISA bus device drivers. The files with **02.sys* are Microchannel bus device drivers and are not needed if you have an ISA bus machine.
- Add a line to the *config.sys* file on the new disk 1 that points to the new *.add* file you've copied. For example, if the *.add* file is *newdev.add*, you need to add the line:

```
BASEDEV=NEWDEV.ADD
```

- Now, install OS/2 from the CD-ROM drive as you would normally, but when prompted for disk number one, insert your new customized disk.

ADDING SCROLL BARS

Q: A maximized OS/2 Window is just not big enough for me, but I don't want to have to use an OS/2 full-screen command prompt. Can I make the window bigger and add a scroll-bar to an OS/2 Window?

A: The default maximized width and height of an OS/2 Window is 80 columns across by 25 lines high. Many people who need to view things in a larger window use options, such as *dir /p*, to display a directory (or window, in this case) one screen at a time. If you want to make the window larger, you can issue the **mode** command in the OS/2 Window. For example, if you want to display an OS/2 Window so that when it is maximized it occupies the entire screen and has a vertical scroll bar, you can issue the command:

```
MODE 80,102
```

which will change the window to 102 columns .

NOWHERE

Q: When I look at the directories OS/2 sets up on my hard disk, I see a *\nowhere* directory. What is it and what does it do?

A: Many people have speculated—not only about what *\nowhere* is, but even what it really implies.

For example, does it mean "now here?" Or is it simply "nowhere?" The truth is, you can say it either way, but the purpose of the *\nowhere* directory is to provide the OS/2 Workplace Shell a place to create transient shell objects. A transient object is one that has no persistent information stored across reboots. Unlike a persistent object, such as a folder, a transient object comes and goes during system operation and has no permanence. The Window List is an example of a transient object.

MORE SECRET KEYS

Q: I like being able to use the cursor keys to recall previously-entered commands. How can I find them faster than cycling through all of them?

A: If you know which command you're looking for, you can find the command quickly by using the <F1> key. The <F1> key acts as an intelligent command-string finder. If the command you were looking for started with the letter P, to quickly find the command so you do not have to key it in again, type the letter **p** and then hit the <F1> key. The most recently entered command string beginning with a P will be displayed. If it's not the one you want, hit the <F1> key again. You can continue hitting the <F1> key to cycle through the command buffer finding all commands beginning with the selected letter. Once found, you can edit the command string, or just hit the <Enter> key to execute it as is.

NOVELL REQUESTER

Q: I've had many problems with OS/2 and the Novell requester. What can you do to help me?

A: A number of problems can occur with Novell code running on OS/2. As I'm sure you know, a Novell requester is available for OS/2 as an option to running Novell code in a DOS session (VDM) under OS/2. Some of the problems belong to OS/2 and others belong to Novell.

Novell Requester 2.01 is required if you are running OS/2 2.1. *r201fx.zip* (or *.exe,* depending on where you get it) from Novell, contains many fixes for the 2.01 OS/2 requester. However, a different solution will fix many more problems.

IBM and Novell have been working closely to resolve the problems known to OS/2 2.1 and the Novell Requester. The first step you can take is to obtain the recently released OS/2 Service Pak for OS/2 2.1, or purchase OS/2 version 2.11. (The Service Pak will bring a 2.1 system to 2.11 level.) The other step is to obtain the latest OS/2 requester code from Novell. You can contact Novell technical support for information on how to obtain this code.

This combination of the Service Pak for OS/2 along with the new OS/2 requester code fixes the known problems with OS/2 and the Novell OS/2 Requester.

LIBPATH REVISITED

Q: In a previous issue, you wrote about using the "." as the first entry in the LIBPATH, which points to the current directory to search. If the current directory is a subdirectory, such as *c:\appl\ subdir1*, will the system also search the directories leading to the current directory (in this case, the root and *c:\appl*)? I have software that uses shared DLLs, which were installed in a common subdirectory, and added to the LIBPATH list. The software also sets up a number of subdirectories, such as *c:\appl\subdir1, c:\appl\ subdir2*, among others. If the system would look in the directories leading to the one specified in LIBPATH, I could move them all to say, *c:\apps* and eliminate the extra entry from LIBPATH. If this method will not work, do you have any alternative suggestions?

A: With respect to the first part of the question, the answer is no, the system does not search all directories above and leading to the individual directory specified in **LIBPATH**. Only directories specifically called out in the **LIBPATH** statement are searched for DLLs.

One suggestion would be to simply put all of the DLLs and executable modules into one large subdirectory. This way, for any and all of the programs you want to execute, you can have the path and working directory be the same, and the system, when starting the program and setting the working directory, will be able to find the DLLs. But, this approach only works if no name conflicts exist in the executable programs. If names conflict, they can not be placed in the same subdirectory. Good examples of this philosophy are Lotus 1-2-3 for OS/2 and Lotus Freelance Graphics for OS/2. They share common DLL files and by installing them into one common directory, you get the benefit of having to search for DLLs in only one place. Because they are in a common subdirectory, only one copy of the file will be on the hard disk.

FORMATTING C:

Q: I'm a novice user who bought a system with OS/2 2.0 preinstalled. I purchased the OS/2 2.1 upgrade package that clearly

states it is intended to be installed over an existing operating system. If it ever becomes necessary to format my *c:* drive, how would I install OS/2 2.1?

A: The OS/2 upgrade packages are identical to the "full pack" packages with one minor difference: the upgrade package has a "sniffer" program that looks for the appropriate operating system on the hard disk when booting for the first time. Once the sniffer finds what it is looking for, it writes a flag on the installation disks. If you want to format your primary hard disk partition at a later date, the sniffer has already verified that you are entitled to upgrade and installation will continue.

It is important to know about this program if you are upgrading and intend to re-partition your hard disk at the same time. If so, boot the upgrade package-installation disks, then choose to select a different partition when prompted for the installation drive. You will be brought to the FDISK program, where you can change partitions, but more importantly, the sniffer will already have written the proper flags to the disks so that you can install afterwards. Do not re-partition and then boot your upgrade installation disks. The sniffer will not find an operating system and will not let you install OS/2. If you find yourself in that situation, you will need to find a set of DOS or OS/2 installation disks to install and put a boot record on the hard disk to satisfy the OS/2 upgrade sniffer.

David Reich has been with the OS/2 development team since 1987. David, a contributing editor to OS/2 Magazine , *has written extensively about OS/2 and is interested in your questions and suggestions. Contact him at CompuServe 76711,632 or Internet speedracer@vnet.ibm.com.*

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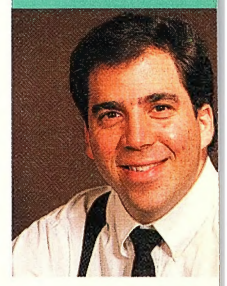

EVERYTHING YOU EVER WANTED TO KNOW ABOUT SEAMLESS WINDOWS

BY DAVID REICH

WIN-OS/2 SEAMLESS

Q: Not all of my Win-OS/2 applications are starting in seamless mode since I applied the 256-color video-driver disk.

A: You should check your DOS settings for the Win-OS/2 program-reference objects that are having the problems. Ensure that the setting for *DOS_UMB* is off for sessions you want to start in seamless mode (a Win-OS/2 Window) and set to on for full-screen Win-OS/2 sessions. To change the setting for *DOS_UMB*, bring up the context menu for the program-reference object you want by using mouse button two. Click on the arrow next to Open and then click on Settings. Now, go to the Session page and click on the Win-OS/2 Settings push-button. Use the mouse pointer or arrow keys to scroll down to the *DOS_UMB* setting. You will see the value on the right, which you can change.

SEAMLESS WINDOWS

Q: What are "seamless" Windows?

A: Microsoft Windows is a graphical user-interface that runs on top of a DOS system. Under DOS, the Windows interface occupies the entire screen, and each application runs in one or more rectangular areas, or windows, on the screen.

OS/2 provides the capability of running applications written for Windows. Windows applications can be run two ways. First, they can be run with a Windows interface that takes up the entire screen, using the Windows Full Screen program object you see in the Command Prompts folder. When running Windows applications in this manner, the Windows interface occupies the entire screen, so you cannot see OS/2 applications running. Here is where "seamless" windows come in. OS/2 has the ability to run Windows programs alongside the OS/2 application window on the OS/2 desktop. This ability is called "seamless" because the Windows applications run next to OS/2 applications without having to go to the full-screen Windows interface.

When running Windows applications seamlessly or in full-screen mode, they are preemptively multitasked with OS/2 applications.

Many drivers can be found on bulletin boards and on-line services, such as CompuServe.

SEAMLESS STABILITY

Q: Is there any difference in stability when running Windows applications in seamless or full-screen mode?

A: Let's start this answer by saying that stability is not threatened by running Windows applications in one mode versus another. In general, Windows applications running under OS/2 are more stable than the same applications running under DOS and Windows. OS/2 runs Windows applications in an address space separate from OS/2 applications and in an address space separate from the operating system. If a Windows application encounters problems, the worst it can do is bring itself down. Unlike Windows, the OS/2 system continues to run.

You can actually add further stability to your Windows applications under OS/2 by running them in seamless mode and in separate sessions. When running Windows

Tips & Tricks *cont'd on p. 81*

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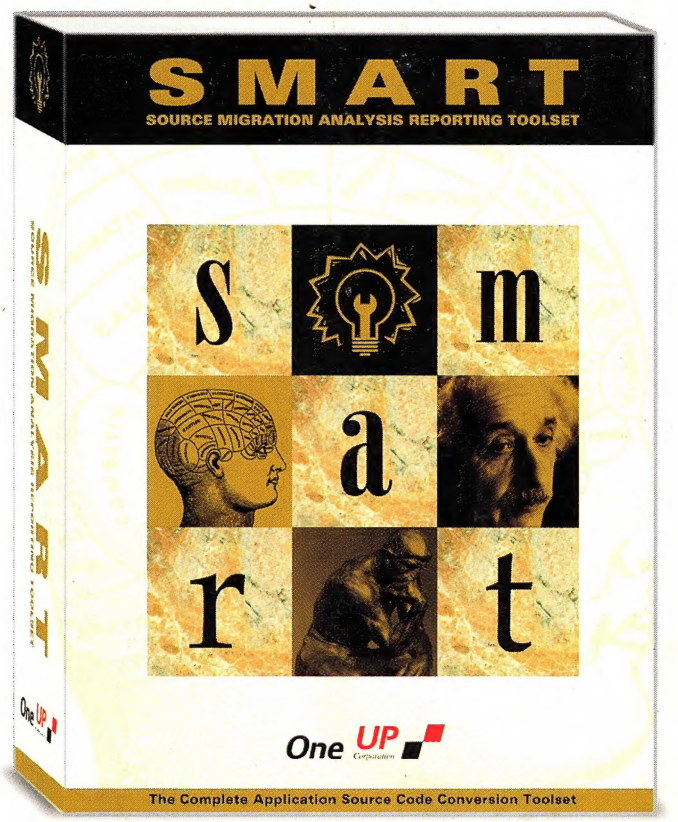

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